DRAFT

PROPOSED REMEDIAL ACTION PLAN
FOR
SITES 1, 2 & 3
NWIRP BETHPAGE, NEW YORK

SECTION 1: PURPOSE OF THE PROPOSED PLAN

The preferred remedy for remediating contaminated soils at the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York is described in this Proposed Remedial Action Plan (PRAP). In addition, the other remedial alternatives which were considered for this site are described in this document as well as the rationale used in the decision making process. The goals of this action are to address contamination within the soils which will then prevent further degradation of groundwater quality as well as to address any potential risks to onsite workers and offsite residents that may exist due to the chemicals present within the soils. The additional objective of groundwater remediation will be addressed by a subsequent PRAP that will be prepared to address onsite groundwater contamination and NWIRP-associated offsite groundwater contamination.

This document is being issued by the United States Department of the Navy (Navy), the lead agency for site activities, and the New York State Department of Environmental Conservation (NYSDEC), the support agency for this action. The Navy, in consultation with NYSDEC and the New York State Department of Health (NYSDOH), will select a final remedy for this site only after careful consideration of all comments submitted during the public comment period.

This PRAP is being issued by the Navy in order to fulfill the public participation requirements of both Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Navy's Installation Restoration (IR) Manual dated April 1992, even though the NWIRP is not a CERCLA site.

This PRAP is also being issued by NYSDEC as an integral component of the citizen participation plan responsibilities provided by Title 6 of the New York Codes, Rules and Regulations (6 NYCRR), Part 375.

Key information, which can be found in greater detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports as well as other reports that are on file at the document repositories set up for this site, is highlighted in this report. The Navy and NYSDEC encourage the public to review these documents to gain a more comprehensive understanding of the site and the environmental activities that have been conducted there. These project documents can be reviewed at any of the following locations:

Bethpage Public Library
47 Powell Avenue
Bethpage, New York 11714
Phone: (516) 931-3907
Hours: 9:30 am - 9:00 pm (Monday-Friday)
9:30 am - 5:00 pm (Saturdays)
12:00 noon - 4:00 pm (Sundays through April)
Closed Sundays (May until October)

NYSDEC Region 1 Office
Building 40 SUNY Campus
Stony Brook, NY 11790
Contact: Mr. Joshua Epstein
Phone: (516) 444-0249

NYSDEC Central Office
50 Wolf Road, Room 222
Albany, New York 12233-7010
Contact: Mr. John Barnes, P.E.
Phone: (516) 457-3395

The Navy, along with the NYSDEC and NYSDOH, will hold a public meeting on July XX, 1994, to hear public comments on this proposed plan. The meeting will be held at _____ and will commence at 7:30 pm.

The selected remedy, as presented in the Record of Decision (ROD), could be different from the preferred alternative described in this document. The preferred remedy may be modified or another response action that is presented in this PRAP may be selected based on any new information and/or public comments received during the public comment period.

The public may comment in person at the public meeting and/or submit written comments until August 12, 1994, to the remedial project manager for this site, Mr. James Colter at the address shown below. These comments will be important to the Navy in selecting a final alternative.

Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, MSC #82
Lester, Pennsylvania 19113-2090
Attn: Mr. James Colter
Phone: (610) 595-0567, Ext. 163

At the conclusion of the public comment period, all oral and written comments will be responded to in the Responsiveness Summary portion of the Navy's Record of Decision (ROD). The ROD will document the Navy's and NYSDEC's selected remedial action plan for the site and is also a legal document which will require the Navy to implement that plan. The ROD will be made available for public review at the Information Repository located at the Bethpage Public Library.

SECTION 2: SITE LOCATION AND DESCRIPTION

NWIRP Bethpage is located in Nassau County on Long Island, New York, approximately 30 miles east of New York City (see Figure 1). This 108 acre site is bordered on the north, west, and south by the Grumman facilities which covers approximately 605 acres, and, on the east, by a residential neighborhood (see Figure 2). The NWIRP is currently listed by NYSDEC as an "inactive hazardous waste site" (#1-30-003B) as is the Grumman Corporation (#1-30-003A) and the Hooker/RUCO site (#1-30-004) located less than 1/2 mile west of the NWIRP Bethpage.

The NWIRP was divided into three sites for the purpose of conducting Remedial Investigations. These three sites encompass most of the 108 acres (see Figure 3). A brief description of each site is presented below.

SITE 1 - FORMER DRUM MARSHALING AREA - This site is located in the middle third of the NWIRP facility and east of Plant 3. It consists of two concrete drum storage pads (no longer active) and an abandoned cesspool leach field. In addition, this area has been used as a storage area for various types of equipment and heavy materials, including transformers.

SITE 2 - RECHARGE BASIN AREA - This area is located in the northeast corner of the Navy's property and north of Site 1. It contains three recharge basins which currently receive non-contact cooling water. Historically, these basins also received rinse waters from Grumman operations. Also located on this site are the former sludge drying beds which no longer exist and have been filled in. Sludge from the Plant 02 industrial waste treatment facility was dewatered in these beds before being disposed of off site.

SITE 3 - SALVAGE STORAGE AREA - This site is located in the north-central portion of the Navy's property, north of Plant 3 and west of the recharge basin area. A portion of this area is used to store fixtures, tools, and other metallic debris including old aircraft parts. Another portion of the site is the location of the current drum marshaling facility and a third section of this site is currently used as a parking lot.

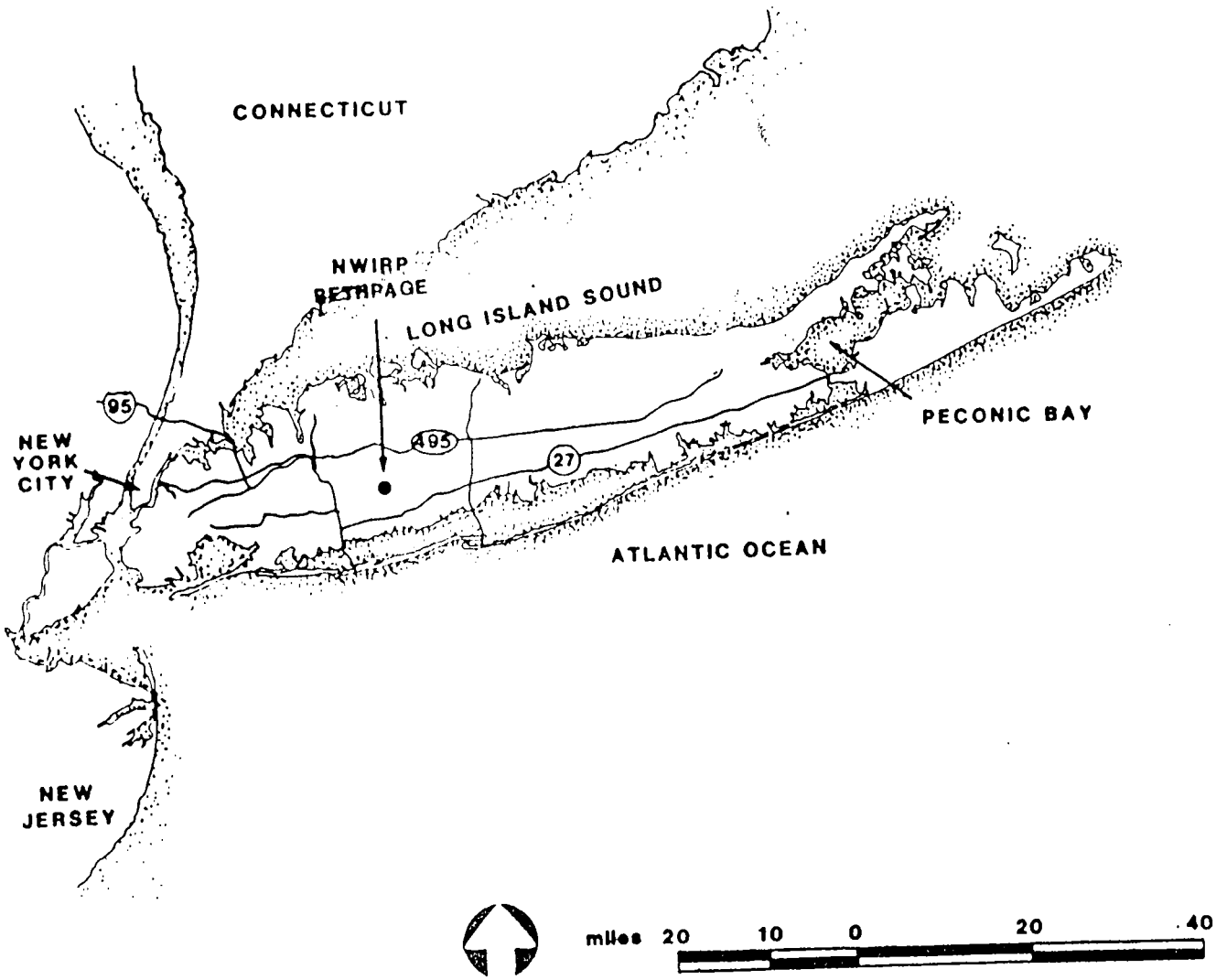


Figure 1

General Location Map,
NWIRP Bethpage, New York

Naval Weapons Industrial
Reserve Plant
Bethpage
Long Island, New York

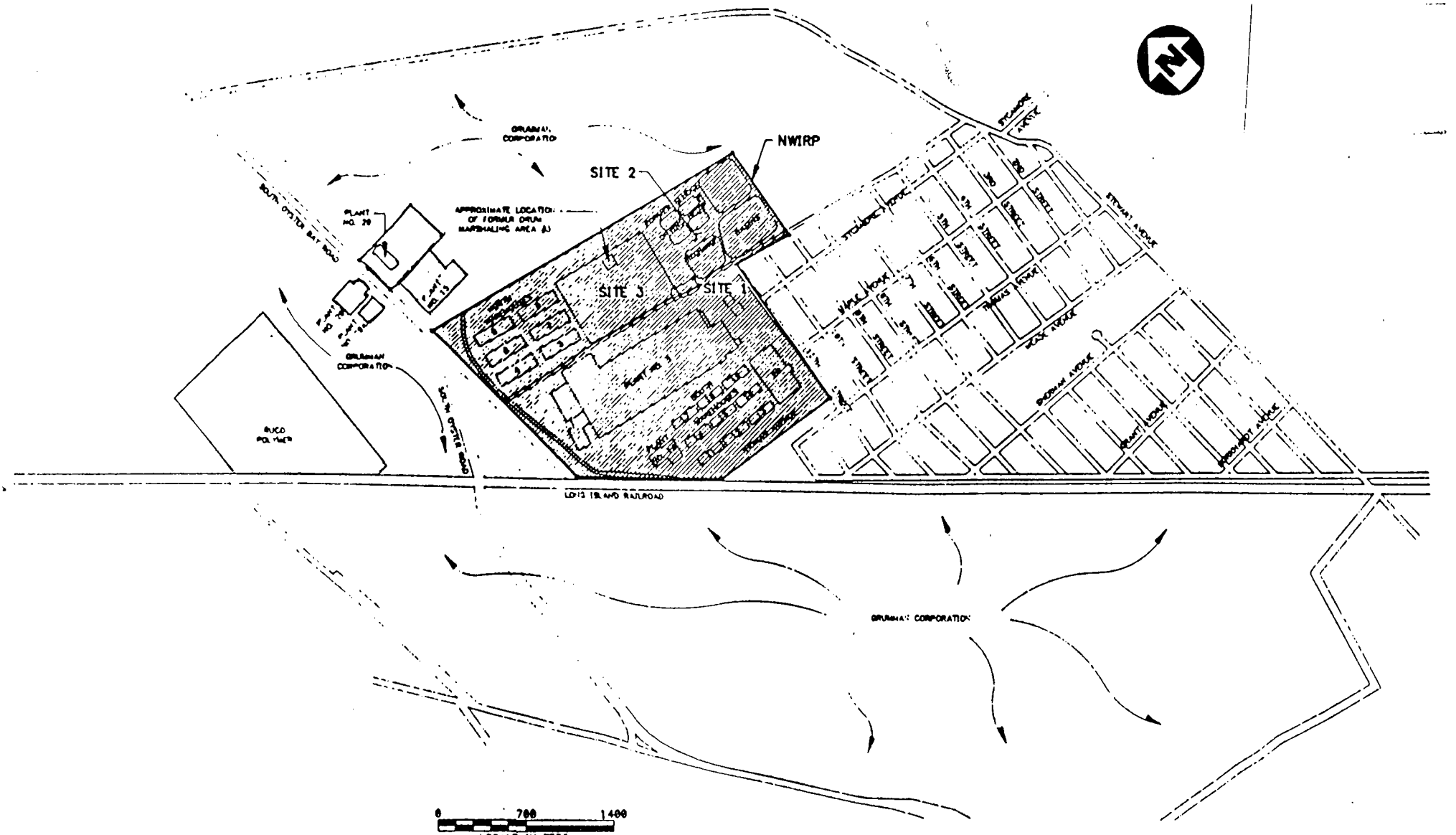


FIGURE 2

SITE LAYOUT MAP

PHASE 2 – REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NWIRP, BETHPAGE, NEW YORK

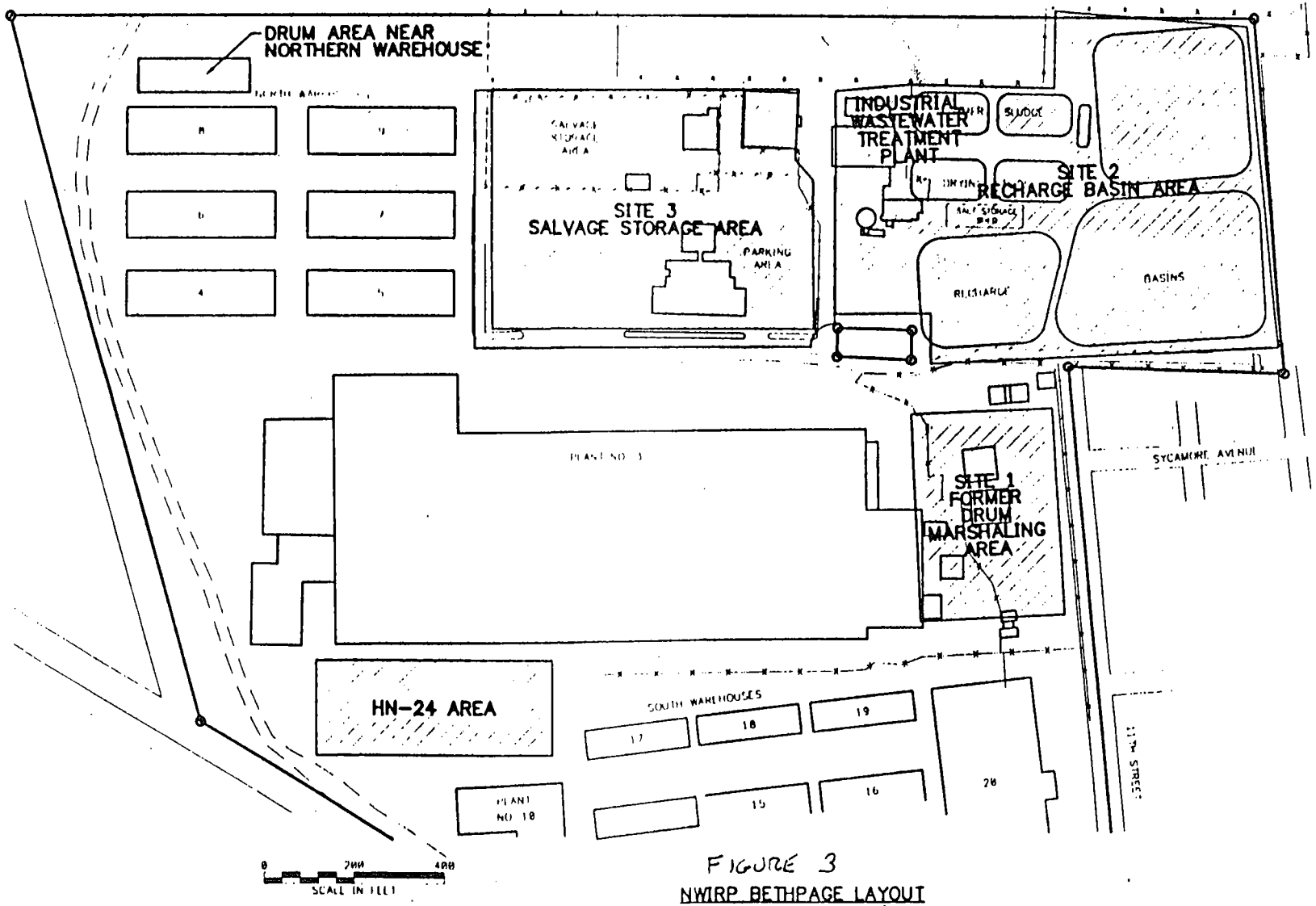


FIGURE 3

NWIRP BETHPAGE LAYOUT
PHASE 2 REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NWIRP, BETHPAGE, NEW YORK

SECTION 3: HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with the requirements of the Superfund Amendments and Reauthorization Act (SARA) of 1986, as well as the Navy's Installation Restoration (IR) Program, the Navy created a Technical Review Committee (TRC). In addition to the appropriate Navy representatives, this committee includes representatives from EPA Region 2, New York State DEC and Department of Health, and local authorities including the local board of health and local water authority. Also included in this committee are representatives from the Grumman Corporation along with their environmental consultant. The overall goal of this committee is to keep all interested parties informed and involved in the Navy's IR program. The role of the committee is to actively participate in the development of the scope of work for continued Remedial Investigations (RI) and Feasibility Studies (FS), as well as provide technical review and comment during the execution of the RI/FS and to assist in the selection of remedial technologies based upon the data gathered by the Navy's consultants.

A Public Meeting was conducted on June 8, 1992 at the Bethpage High School, during which the results of the Navy's Phase I Remedial Investigation were presented. This meeting was held in conjunction with Grumman Corporation, which presented the results to date of their Remedial Investigation.

Other aspects of community participation have included:

* establishment of information repositories where all of the documents generated by the Navy are on file and are available for public review (see above);
* development of a "mailing list" of interested parties (e.g. local citizens, public officials, governmental agencies, media, etc.);
* distribution of Fact Sheets which have been issued on several occasions to keep those on the mailing list informed as to the status of the Navy's environmental activities as well as any future actions planned by the Navy.

In addition, the Navy also sponsored a neighborhood workshop on November 18, 1992, at the Bethpage High School to informally meet with local citizens to discuss any issues or concerns that they had regarding the upcoming offsite environmental work that was planned for their neighborhood.

SECTION 4: SITE HISTORY

4.1: Operational/Disposal History

The NWIRP was established in 1933 and is still active. Since its inception, the primary mission for the facility has been the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft.

The facilities at NWIRP include four plants (Nos. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes (north and south), a salvage storage area, water recharge basins, an industrial wastewater treatment plant and several smaller support buildings.

The following is a discussion of the waste handling and disposal practices at each of the three sites at NWIRP Bethpage:

SITE 1: From the early 1950's to 1978, drums containing liquid wastes were stored on a cinder covered area over a cesspool leach field. This leach field may have been used to discharge process wastewater. In 1978, the drum storage area was moved a few yards to the south to a 100- by 100-foot concrete pad. This pad did not have a cover nor were there any berms around it. In 1982, the drum storage area was moved to its present location at Site 3.

Materials which were stored at Site 1 included various solvents. Cadmium and cyanide were also stored in this area from the early 1950's through 1974. Approximately 200 to 300 drums were stored at these locations at any given time. Reportedly, all drums of waste which were stored at these areas were taken off-site by a private contractor for treatment and disposal.

SITE 2: Prior to 1984, some Plant 3 production-line rinse waters were discharged to the recharge basins. These waters were directly exposed to chemicals used in the industrial processes (involving the rinsing of manufactured parts). Only non-contact cooling water is currently discharged to these basins. The source of this water is on-site production wells.

On at least one occasion (1956), hexavalent chromium was detected in the recharge basins water at concentrations in excess of allowable limits. This matter was discovered and handled by the Nassau County Department of Health at that time.

Adjacent and west of the recharge basins are the former sludge drying beds. Sludge from the Plant 02 Industrial Waste Treatment Facility (located in the southern portion of the Grumman complex) was dewatered in these beds before being disposed of off-site.

Potential contaminants of concern at this site include hexavalent chromium, nitric acid, and sulfuric acid.

SITE 3: The NWIRP Bethpage salvage storage area has been used for the storage of fixtures, tools, and metallic wastes, such as aluminum and titanium scraps, since the early 1950s. Cutting oils dripped from some of this metal; however, this contamination is superficial. About 1960, the salvage storage area was reduced in size to accommodate parking.

In addition to salvage storage, a 100- by 100-foot area within this site was used for the marshaling of drummed wastes. This area was reportedly covered with coal ash cinders. This activity took place between the early 1950s and 1969. Wastes stored in this area included halogenated and nonhalogenated solvents. The exact location is not known, but is believed to be near the current drum marshaling area. The current drum marshaling area has a concrete pad with a berm to contain spills and a steel canopy over it.

4.2: Remedial History

An Initial Assessment Study (IAS), conducted in 1986, was used to document contamination at NWIRP Bethpage. After that, a two-phase remedial investigation (RI) was then initiated. The Phase 1 RI was completed in May 1992. The Phase 2 RI was then implemented to supplement the Phase 1 results and was completed in October 1993. Based upon the data gathered by both phases of the RI, a Feasibility Study (FS) was conducted. This FS was finalized in March 1994. The following is a more detailed discussion of each of the studies conducted at NWIRP Bethpage.

Initial Assessment Study

An Initial Assessment Study (IAS) of the NWIRP Bethpage and NWIRP Calverton sites was conducted in 1986. Based on the results of this study, it was concluded that three areas at the Bethpage site may pose a threat to human health or the environment. These three sites are known as Site 1 - Former Drum Marshaling Area (identified as Site 7 in the IAS), Site 2 - Recharge Basin Area (identified as Site 8 in the IAS), and Site 3 - Salvage Storage Area (identified as Site 9 in the IAS). These sites were renumbered to avoid confusion with the site designations for similar activities being conducted at the NWIRP Calverton.

Remedial Investigation

In August 1991, a Remedial Investigation (RI) was initiated at NWIRP Bethpage to attempt to determine the nature and extent of the contamination found during the IAS and how that contamination was related to each of the three sites.

Based on the conclusions of the Phase 1 RI, it was decided to proceed with a Phase 2 RI. The objectives of this second phase study were to determine the extent of PCB contamination at all three sites as well as the extent of the offsite groundwater contamination to the east in the adjacent neighborhood. Also, there was an attempt to identify the source of the significant finding of TCE in well HN-24I discovered during the Phase 1 RI.

The following is a list of actions taken by the Navy during the RI phases to determine the nature and extent of contamination at NWIRP Bethpage:

* Soil-gas surveys were conducted at Sites 1, 2, and 3. Volatile organic compounds (VOCs) can be found in the air spaces between soil particles (pore spaces) in the unsaturated, or vadose, zone. Gas samples were extracted from pore spaces and analyzed for VOCs. This technology is useful as a screening tool for identifying source areas of VOC contamination.

* Sub-surface and surficial soil samples were collected as a means of verifying the soil-gas surveys and to determine the locations of potential source areas for other contaminants of concern, such as metals and polychlorinated biphenyls (PCBs).

* Temporary monitoring wells were installed and sampled in order to develop a rough picture of the groundwater quality at the water table. This was another method used to augment the soil-gas surveys.

* Permanent monitoring wells were installed in order to monitor groundwater quality on and off of the NWIRP facility and to aid in the development of a groundwater flow model. The locations of these wells were determined based on the results of the temporary monitoring well program, from a review of the site history, hydrogeological considerations, and preliminary computer modeling results. These wells consisted of 10-foot screened sections which were placed at three levels ranging from 60 to 250 feet below grade. These wells were also used to estimate the physical properties of the aquifer at the NWIRP.

The analytical data generated during the RI was compared to Applicable or Relevant and Appropriate Requirements (ARARs) and used in developing remedial alternatives for this site. Groundwater and drinking water criteria identified for this site were based on the Federal drinking water standards known as Maximum Contaminant Levels (MCLs) and Part 5 of the New York State Sanitary Code. For the evaluation of soil analytical results, Federal and State cleanup guidelines for the protection of groundwater, site background conditions, and risk-based remediation criteria were used to develop potential remediation goals.

Brief summaries of the results of the RI are presented in the following sections. For a more comprehensive and detailed description of the RI results, the Phase 1 and 2 RI Reports, located at the Bethpage Public Library, should be consulted.

4.2.1 - Site 1

Phase 1 RI

A soil gas survey was conducted to help define the extent of volatile organic contamination and to assist in the selection of groundwater sampling locations. The samples were analyzed for select chlorinated-volatile organics. Site 1 was found to contain the highest soil gas readings of the three sites and the survey indicated that a source of volatile organic contamination was present near the former drum marshaling area and extended to the south.

Sampling of the subsurface soils revealed solvent contamination with concentrations that would contaminate groundwater in excess of Federal and State drinking water standards if the compounds were to migrate to the water table. In addition, arsenic was present in one of nine subsurface soil samples at a concentration that may classify it as a hazardous waste.

PCBs were found in two surface soil samples taken at Site 1 that exceed Federal and State criteria for acceptable PCB contamination.

A temporary monitoring well program was also conducted at this site. The wells were sampled and analyzed for select chlorinated- volatile organics. The results of this program confirmed that Site 1 was a source area of solvent contamination in the groundwater starting near the former drum marshaling area and extending downgradient towards the southwest. Solvents are common chemicals used at the facility.

Seven permanent monitoring wells were installed at Site 1. Two rounds of groundwater sampling were conducted in this area. These wells contained 34 to 19,000 parts per billion (ppb) of VOCs. The Federal and State drinking water standard 5 ppb per compound.

Phase 2 RI

Surface and subsurface soil samples from seven locations were taken during the Phase 2 RI in an attempt to define the extent of PCB contamination. PCB's were detected at all seven locations with concentrations ranging from 1.2 parts per million (ppm) up to 1,470 ppm. For comparison, Federal/State criteria for acceptable PCB concentrations are 1 ppm and 10-25 ppm for residential-use and industrial-use scenarios, respectively. The finding of PCB's at all sampling locations led to the conclusion that PCB contamination is wide spread over most of Site 1. Figure 4 shows the location where the maximum PCB concentration was found. This area was then targeted by the Navy for an interim response action in order to eliminate any potential threats from this area to onsite workers and offsite residents. See Section 4.3 for a more detailed description of the actions taken.

Two temporary monitoring wells were installed as part of the Phase 2 RI. These wells were installed primarily to provide water level measurements during the aquifer pumping test program. The wells were sampled and analyzed for the same compounds as previously analyzed for during the Phase 1 RI. The results of this sampling are similar to, and therefore confirm the Phase 1 RI conclusion, that this area is a source of volatile organic contamination.

4.2.2 - Site 2

Phase 1 RI

A soil gas survey was conducted to help define the extent of volatile organic contamination and to assist in the selection of groundwater sampling locations. The compounds which were being analyzed for were the same as those analyzed for at Site 1. The results of the survey seem to indicate the presence of a minor source area somewhere in the center of the site where low-level readings were obtained in the shallow samples. However, it is expected that this contamination, should it reach the water table, would not contaminate the groundwater above drinking water standards.

Lesser concentrations were obtained closer to the edges of the site and non-detects were obtained at the outer boundary.

Subsurface soil sampling revealed low-level VOC contamination. PCBs were also identified at a depth of three feet at two locations. The highest PCB concentration detected at this site during the Phase 1 RI was 6.8 ppm. For comparison, Federal/State criteria for acceptable PCB concentrations are 1 ppm and 10-25 ppm for residential-use and industrial-use scenarios, respectively.

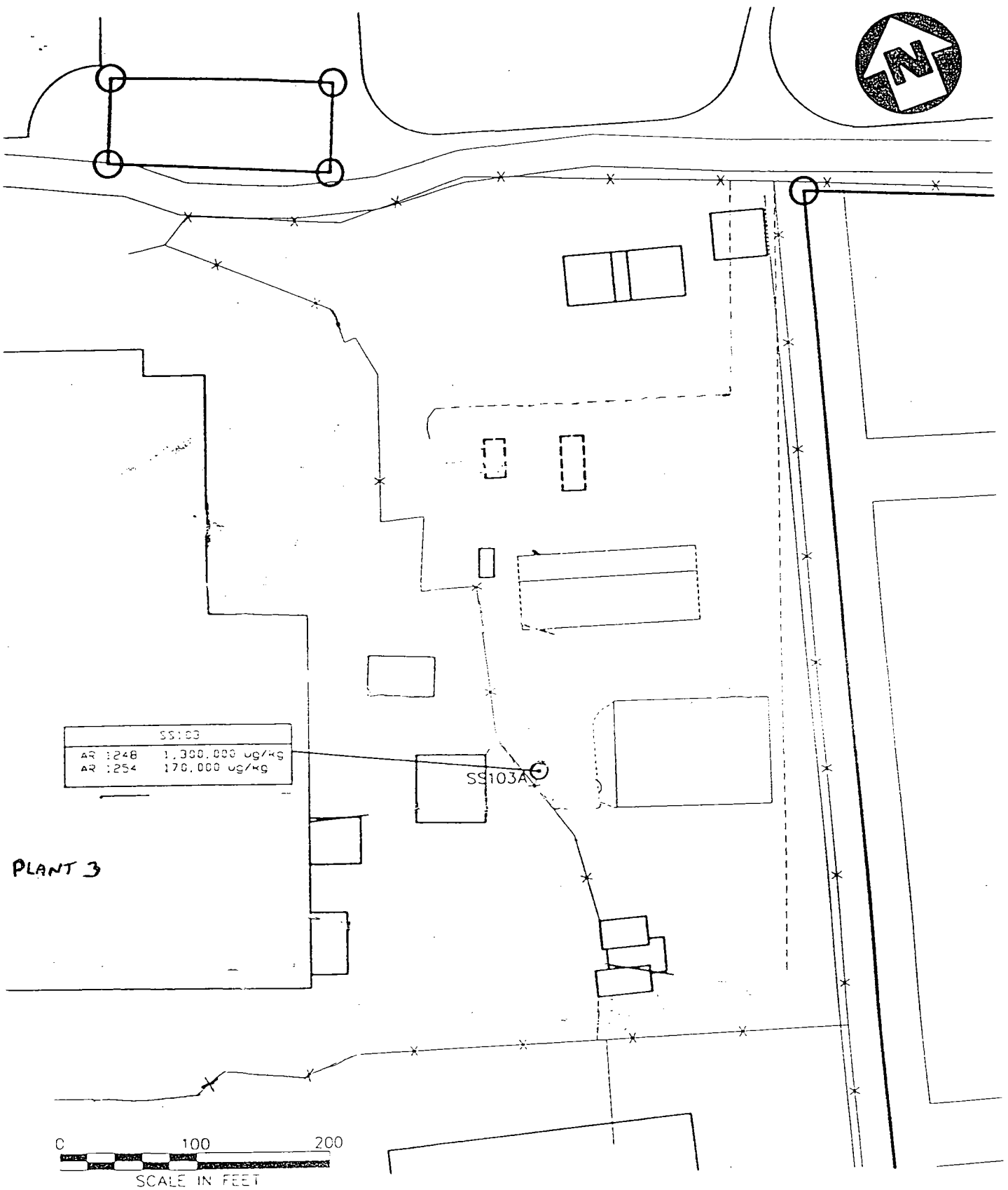


FIGURE 4

SITE 1 – PCB SOIL RESULTS
PHASE 2
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NWIRP, BETHPAGE, NY

HALLIBURTON NUS
Environmental Corporation

A total of 13 surface soil samples were obtained at Site 2. In general, trace to low-level VOC's were detected. PCB's were detected in most of the areas of Site 2, especially in the southern and western portions. Concentrations of PCB's ranged up to 3 ppm.

Surface water and sediment samples were taken in the recharge basins. Trace to low-level VOC's were identified in the surface water samples with TCE being the most notable. The concentrations found are similar to those found in the production wells which are the source of this water. Sediment samples from four locations revealed solvent contamination at trace to very low levels.

Eleven temporary monitoring wells were sampled and analyzed for the same VOC's as analyzed for at Site 1. Volatile organic compounds were detected but only in four of the wells and the highest concentration was only 9 ppb (near the southern boundary of Site 2). For comparison, the Federal and State drinking water standard is 5 ppb per compound.

Phase 2 RI

Ten additional surface and subsurface soil samples were taken as part of the Phase 2 RI in an attempt to further define the extent of PCB contamination. PCB's were detected at all locations with concentrations ranging from 0.048 ppm up to 33.6 ppm. As with the case with Site 1, the finding of PCB's at all locations sampled led to the same conclusion that PCB contamination is wide spread over most of the site but at significantly lower concentrations than those found at Site 1.

4.2.3 - Site 3

Phase 1 RI

A soil gas survey was conducted at this site to help define the extent of volatile organic contamination and to assist in the selection of groundwater sampling locations. The compounds which were being analyzed for were the same as those analyzed for at Sites 1 and 2. The results of the survey seem to indicate a potential volatile organic source area near the southwest portion of the site.

Sampling of the subsurface soils revealed the presence of low-level VOCs. In general, concentrations of compounds in samples obtained at 19 feet were not significantly greater than concentrations at 3 feet. The results seem to indicate that there appears to be an overall trace of low-level chlorinated ethene contamination at this site. PCB's were not identified in any subsurface soil samples.

A total of eight surface soil samples were taken at Site 3. In general, trace to low-level VOC's were detected in the surface soil samples. PCB's were detected in the northern and western portions of the site but at a maximum concentration of only 0.083 ppm.

Nine temporary monitoring wells were sampled and analyzed for the same VOCs as analyzed for at Sites 1 and 2. Solvent contamination was detected in eight wells at a maximum concentration of 76 ppb. For comparison, the Federal and State drinking water standard is 5 ppb per compound. Although this site could be a unique source area of groundwater contamination, the plume is not nearly as distinct or as significant as at Site 1.

Phase 2 RI

One additional surface soil sample was taken as part of the Phase 2 RI. No PCB contamination was detected in this sample. The results of the Phase 1 and Phase 2 data indicates that PCBs are not a significant concern at Site 3.

4.2.4 - Other Areas of Investigation

HN24 Area

Additional work was required during the Phase 2 RI in an attempt to identify the source of solvent contamination found during the Phase 1 RI in well HN-24I (see Figure 5). Testing of water in this well revealed trichloroethene (TCE) at a concentration of 58,000 ppb. For comparison, the Federal and State drinking water standard for TCE is 5 ppb. Of particular interest was that TCE was the only volatile organic found in this well. At all other wells sampled at the NWIRP facility, other solvents (1,1,1-trichloroethane, tetrachloroethene) were always found at similar concentrations. This was not the case in well HN-24I. Subsequent sampling of this well during the Phase 2 RI showed that the concentration of TCE had decreased, but not significantly. This could be due to the volatile nature of this compound as well as variations in sampling and analysis techniques.

Based on current and historic groundwater flow patterns, potential sources of this contamination were identified. These included a former coal pile storage area; Site 1; an offsite industrial area upgradient of NWIRP (Hooker/RUCO Superfund Site); Plant 3; and a drum marshaling area near the northern warehouses. A soil gas program was conducted to investigate the possibility of the source area being at Plant 3 or at the northern warehouse area. Additional monitoring wells were installed to investigate the former coal pile storage area, Site 1, and the adjacent Hooker/RUCO Superfund site.

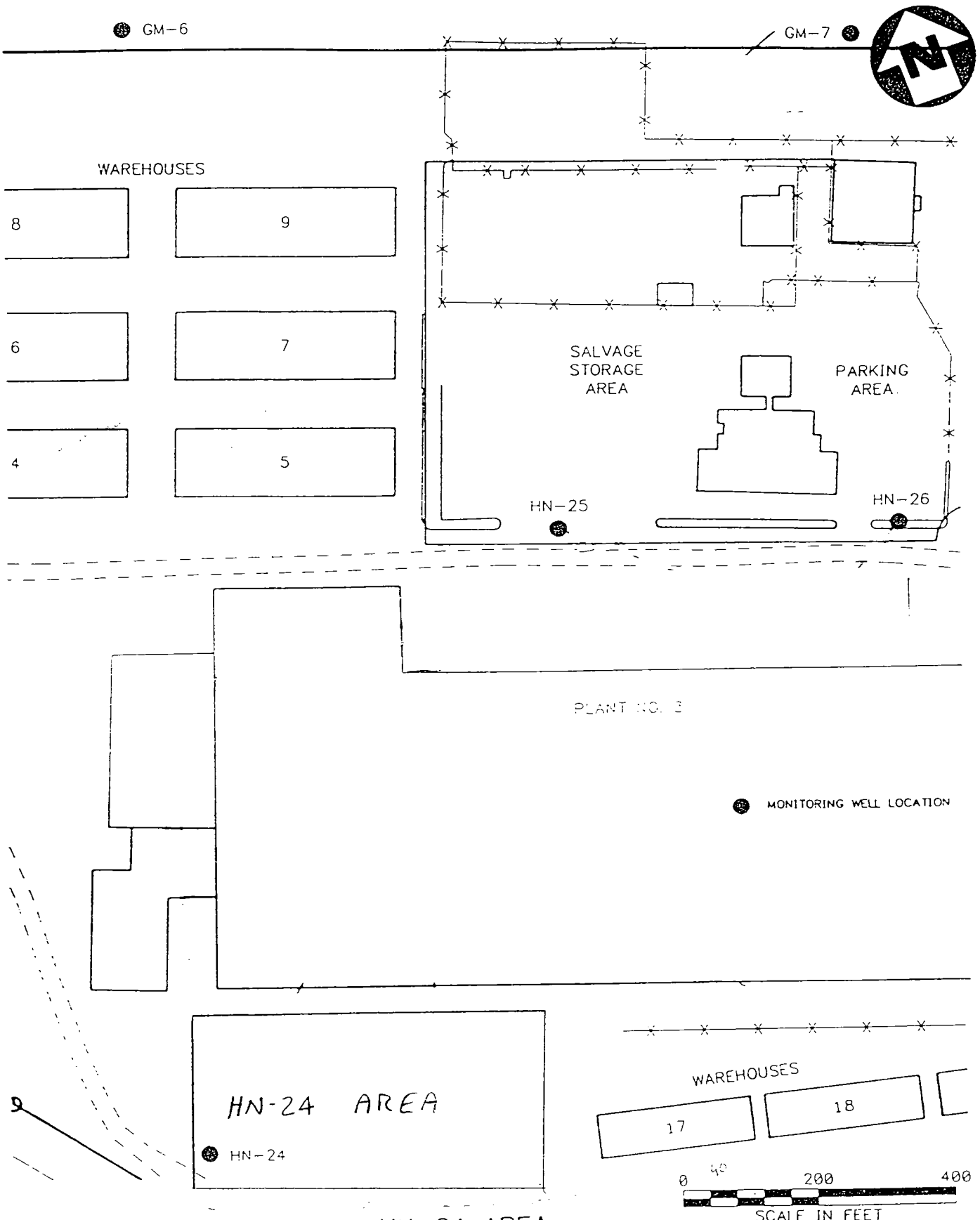
Two soil gas readings were obtained adjacent to and immediately downgradient (south) of the active drum storage area. TCE was detected, but at significantly lower levels, indicating that this area is not the source of the contamination at HN-24.

A review of Plant 3 operations, both past and present, indicated several areas where a source area of TCE could be present. Based on that review, soil gas samples were obtained near each of the suspected locations. A total of 27 soil gas samples were taken from all of the suspected areas plus an additional 5 samples from presumably clean areas to determine background conditions. These 32 samples were taken and analyzed with a total organic volatile analyzer (OVA) since this soil gas program was intended to be a relatively non-intrusive screening technique.

An additional seven soil gas samples were then taken at those areas where the initial soil gas readings were the highest. However, this time the samples were analyzed with an in-field gas chromatograph (GC) in order to determine the chemical-specific concentrations in the soil gas. The results indicated that the honeycomb cleaning area is a potential source of volatile organic contamination. However, since its location is side/downgradient of Site 1, it is possible that the soil gas contamination is a result of contaminated groundwater flowing from Site 1 beneath Plant 3. Also, the concentrations of TCE in the soil gas taken at this location were not as significant. Therefore, it is unlikely that Plant 3 is the source of the contamination at HN-24, although it has been determined that the soils beneath Plant 3 will require remediation.

As previously mentioned, additional permanent monitoring wells were installed around HN-24I to evaluate other potential source areas (see Figure 6). The first monitoring well, HN-24I1, was placed in the location of the former coal pile area and in between Site 1 and the HN-24 area. The measured TCE concentration in this well was significantly lower. This leads to the conclusion that the contamination in HN-24I did not originate at either the coal pile area or Site 1.

The second monitoring well, HN-24I2, was placed in between the HN-24 area and the potential source areas to the north (Plant 3 and northern warehouse area). The analytical results of this well were almost identical to that of the second round of sampling done at HN-24I. That is, only TCE was detected and at a similar concentration to that found in HN-24I (12,000 ppb).



HN-24 AREA

PHASE 2 REMEDIAL INVESTIGATION/
FEASIBILITY STUDY
NWIRP, BETHPAGE, NEW YORK

FIGURE 5

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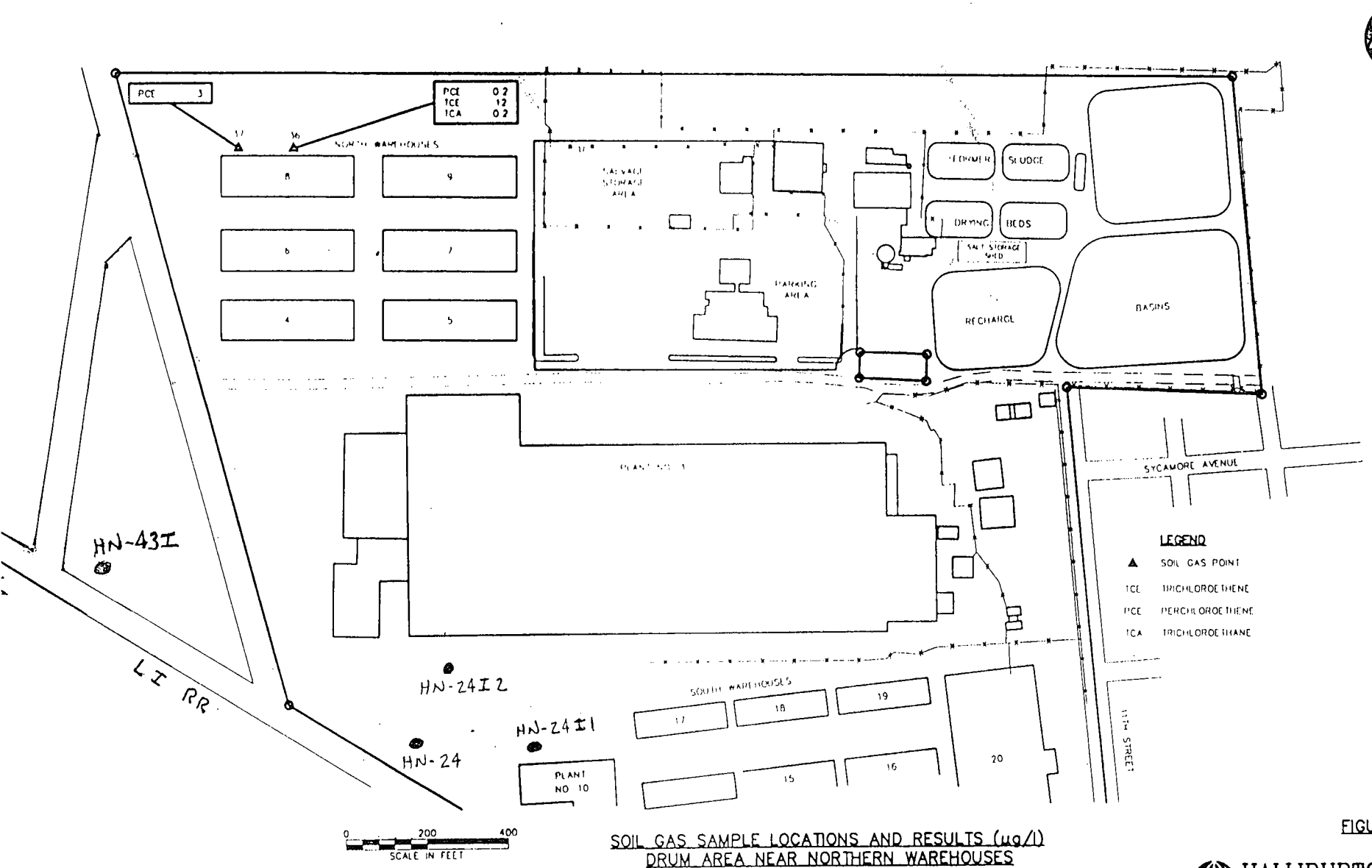
Environmental Corporation



SOIL GAS SAMPLE LOCATIONS AND RESULTS (ug/l)
DRUM AREA NEAR NORTHERN WAREHOUSES
PHASE 2 REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NWIRP, BETHPAGE, NEW YORK

FIGURE 6

HALLIBURTON NUS
Environmental Corporation

The third monitoring well, HN-43I, was placed upgradient of HN-24I in between the HN-24 area and the Hooker/RUCO superfund site. An evaluation of split spoon samples and a groundwater sample at this location did not indicate the presence of significant contamination as had been found at both HN-24I and HN-24I2. However, potential offsite sources have not been ruled out.

In summary, the Navy failed to locate a source area which would account for the significant TCE readings in well HN-24I. There is no doubt that contamination is present at this area and that some type of groundwater remediation will be necessary. This issue will be further addressed by the second operable unit planned for NWIRP Bethpage and the subsequent PRAP.

Residential Neighborhood

Eleven temporary monitoring wells were installed in the residential area east of the NWIRP site (see Figure 7) in order to characterize the extent of shallow groundwater contamination associated with Site 1 and to help identify the best location for the installation of permanent monitoring wells. Various concentrations of compounds were found in 6 out of the 11 wells ranging from 0.11 ppb (well R-04) to 22.49 ppb (well R-05). For comparison, the Federal and State drinking water standard is 5 ppb per compound.

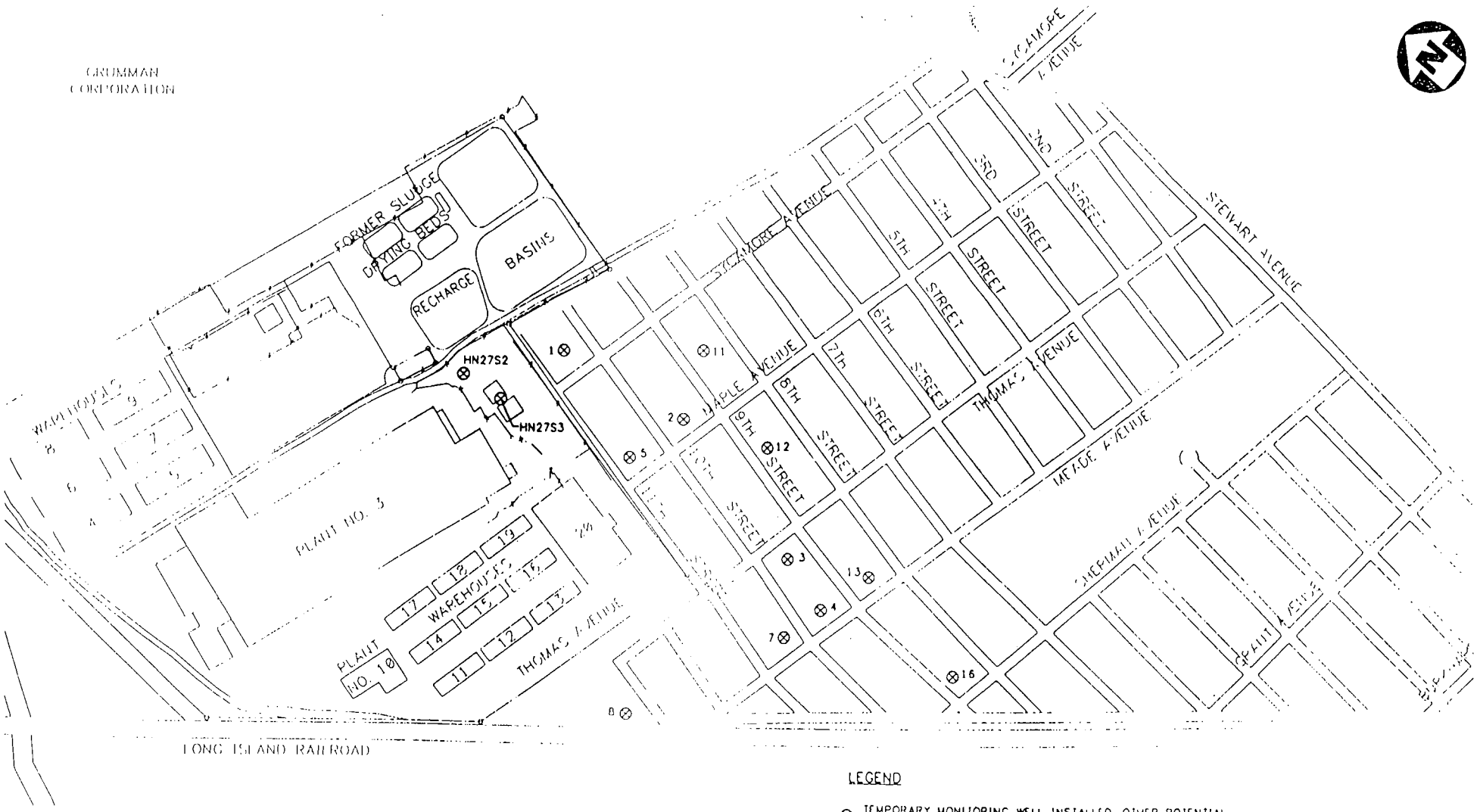
Based on the results of the temporary monitoring well program, three permanent monitoring well clusters were then installed (see Figure 8) in order to evaluate the horizontal and vertical extent of solvent-contaminated groundwater in this area. Each well cluster consisted of a shallow-depth well (approximately 50 feet below grade) and an intermediate-depth well (100 to 150 feet below grade).

The results of the offsite monitoring well program indicated that the shallow groundwater contamination associated with Site 1 is limited to areas within approximately 100 feet east of Site 1, but continues south to near the Long Island Railroad. There is, however, additional shallow groundwater contamination at several locations in this area which are likely attributable to the recharge basins (Site 2). The intermediate-depth contamination in the residential neighborhood extends east toward Stewart Avenue and south to the Long Island Railroad.

4.3: Interim Remedial Measures

An interim remedial action was initiated by the Navy during July 1993 to address the area at Site 1 where the significant hit of PCB's was detected (1,470 ppm). Because of the high reading, this area posed a threat to onsite workers in excess of EPA standards. This potential threat triggered the Navy's action. This area was tested using field screening kits to identify the outer edges of the significant PCB contamination (those areas greater than 50 ppm) and that area was then covered with eight to ten inches of soil to eliminate risks associated with fugitive dust and dermal contact (see Figure 9). The risk posed by PCB's at this site was originally 2.0×10^{-4} for the onsite worker, however, the residual risks to PCB's after the interim action was reduced to 9.8×10^{-6}, which is within the range of acceptable risk as defined by the EPA.

Another interim remedial action will be conducted by the Navy to address groundwater contamination emanating from the NWIRP facility and migrating downgradient towards the Bethpage Water District's (BWD) public water supply wells (see Figure 10). South of the Navy's property, as well as Grumman Corporation property, are three clusters of public water supply wells known as BWD Plants 4, 5, and 6. Computer modeling conducted as part of the Phase 2 RI has predicted that groundwater, over the years, has originated at source areas on the Navy's property, as well as other non-Navy source areas, and has migrated south towards these water supply wells. To date, solvent contamination at levels below the Federal and State standards has been detected at BWD Plants Numbers 4 and 5. Contaminant levels greater than standards have been detected at BWD Plant #6; however, after treatment, this water meets Federal and State standards.



LEGEND

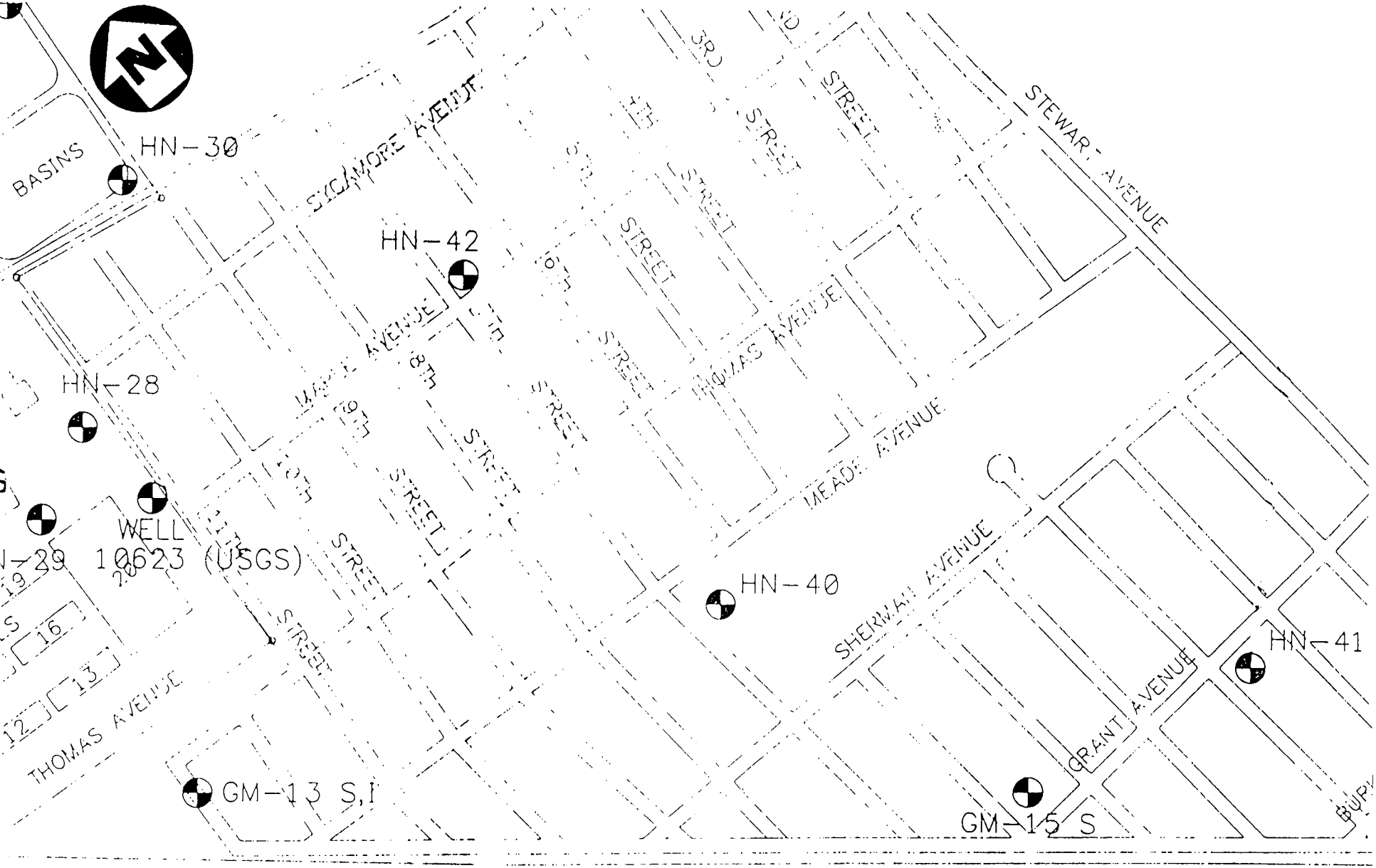
⊗ TEMPORARY MONITORING WELL INSTALLED. OTHER POTENTIAL LOCATIONS SHOWN IN THE WORK PLAN WERE NOT INSTALLED.

TEMPORARY MONITORING WELL POINT LOCATIONS
PHASE 2 – REMEDIAL INVESTIGATION FEASIBILITY STUDY
NWIRP, BETHPAGE, NEW YORK

0 400 800
SCALE: IN FEET

FIGURE 7

HALLIBURTON NUS
Environmental Corporation

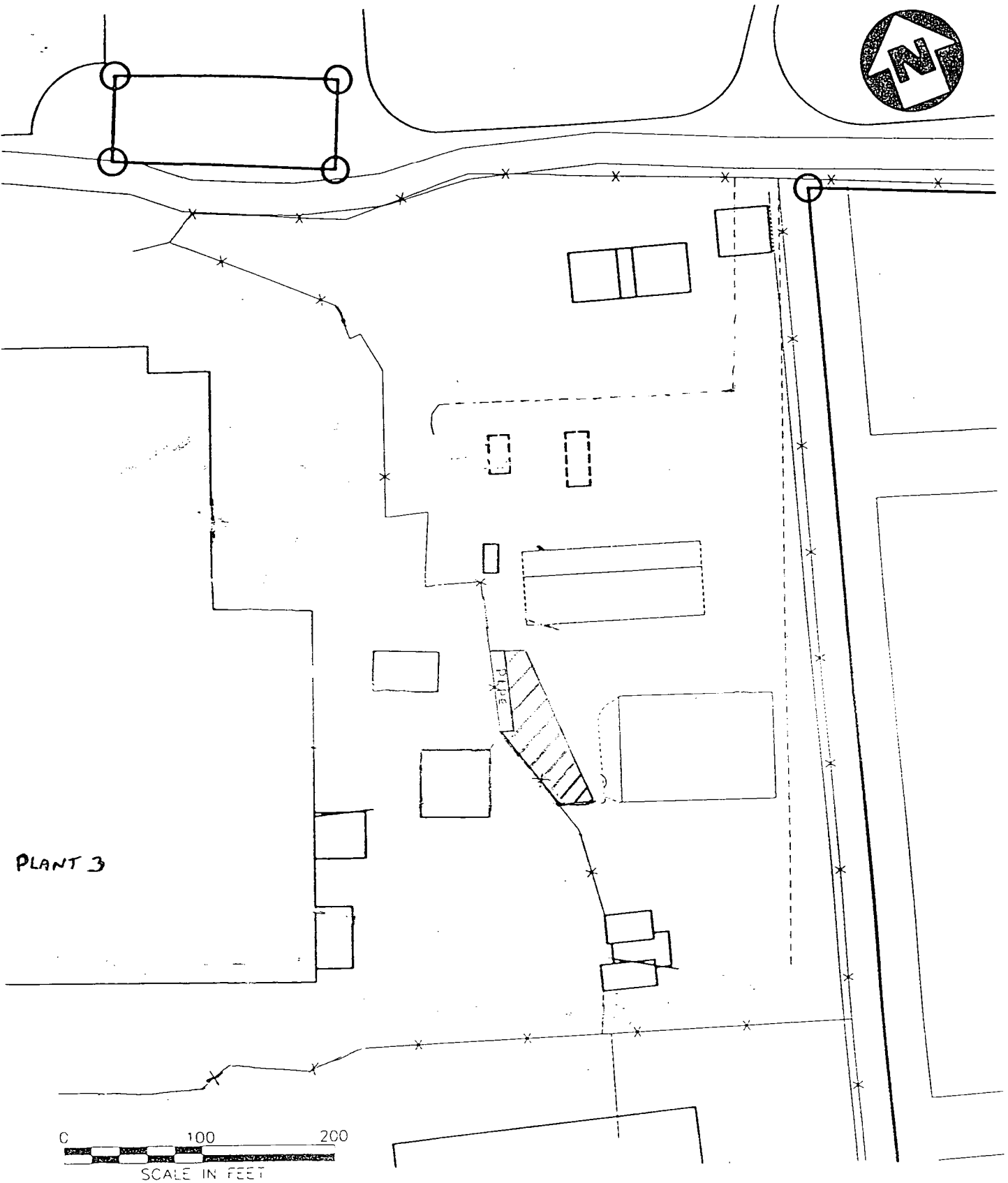


0 400 800
SCALE IN FEET

FIGURE 8

OFFSITE: RESIDENTIAL NEIGHBORHOOD
PHASE 2 REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NWIRP, BETHPAGE, NEW YORK

HALLIBURTON NUS
Environmental Corporation

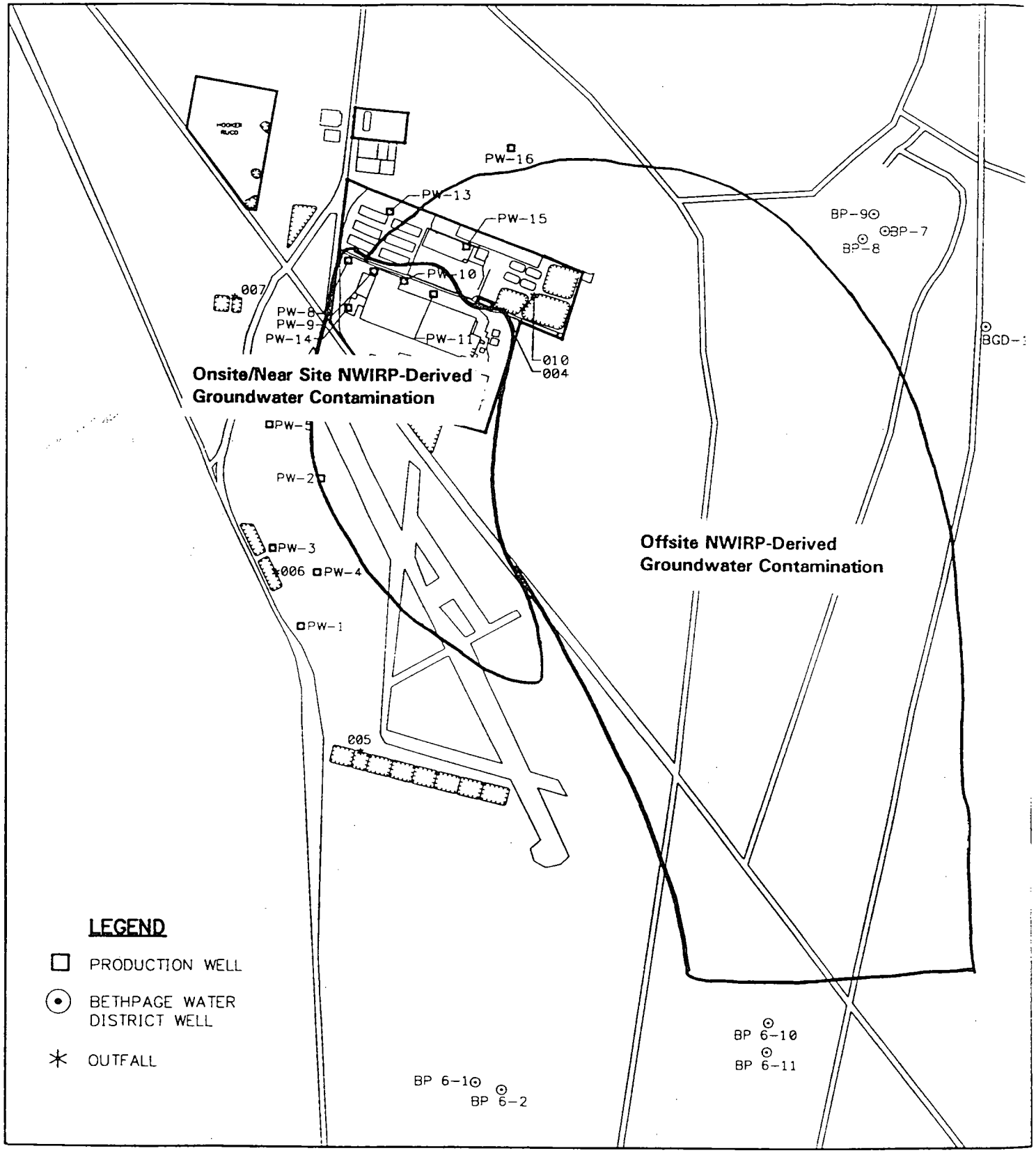


PCBs > 50 ppm

FIGURE 9

SITE 1 – PCB SOIL RESULTS
PHASE 2
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NWIRP, BETHPAGE, NY

HALLIBURTON NUS
Environmental Corporation



ESTIMATED AREAL EXTENT OF ONSITE/NEAR SITE AND OFFSITE NWIRP-DERIVED GROUNDWATER CONTAMINATION FEASIBILITY STUDY, NWIRP BETHPAGE, NEW YORK

FIGURE 10

HALLIBURTON NUS
Environmental Corporation

To counter this contamination, the Grumman Corporation has funded treatment systems for BWD Plant's 4 and 6. As part of this interim action, the Navy will fund a treatment system for Plant 5. By cooperatively addressing this issue, the Navy and the Grumman Corporation have taken steps to insure that the public water supplies in this area will be within the Federal standards set for safe drinking water.

This interim action will consist of either an air stripping or granular activated carbon (GAC) treatment system(s) for the current potable wells of concern at BWD Plant 5. The Bethpage Water District is currently designing this unit(s). Each well would pump contaminated groundwater through the treatment system to remove the VOCs and the treated groundwater would then be distributed. No offgas treatment is anticipated as the contaminant concentrations are sufficiently low enough to warrant treatment.

4.4 Feasibility Study

After completion of the Phase 2 RI, a Feasibility Study (FS) was initiated. The objectives of this study were:

(1) to take the information gathered during both phases of the RI and develop remedial action objectives and goals which would minimize and/or prevent risks to human health and the environment while complying with ARARs.

(2) to identify and screen potential remedial technologies which would satisfy objective 1.

(3) to take the technologies supplied under objective 2 and assemble them into remedial action alternatives.

(4) to take the remedial action alternatives and do a detailed analysis on each one based on the nine criteria items defined in the National Contingency Plan (NCP), namely: overall protection of human health and the environment; compliance with ARARs; short-term effectiveness; long-term effectiveness; implementability; reduction of toxicity, mobility or volume; cost; state acceptance; and community acceptance.

4.5 Proposed Remedial Action Plan

Upon finalization of the FS in March 1994, this proposed remedial action plan was developed to briefly describe the contents of the RI and FS and to present to the public the Navy's and State's proposed plan for remediating soils at NWIRP Bethpage.

One of two operable units planned for NWIRP Bethpage is described in this PRAP. The first operable unit will consist of remediation of the onsite soils at NWIRP Bethpage. The main contaminants in the soils which are to be addressed are metals in excess of the hazardous waste criteria, VOCs in excess of the remedial action goals, and PCBs in excess of 10 ppm.

The second operable unit will address the remediation of the deeper onsite and offsite groundwater. The time frame for issuance of a PRAP for the second operable unit has not yet been established. The second PRAP will be prepared in coordination with other activities being conducted by both Hooker/RUCO and the Grumman Corporation.

How about off-site soil? (Dale's comment that soil contam. can't just end at the property boundary.

SECTION 5: RISK ASSESSMENT

5.1: Summary of Site Risks

During the RI/FS, an analysis was conducted to estimate the health or environmental problems that could result if the soil contamination at NWIRP Bethpage was not remediated. This analysis is commonly referred to as a baseline risk assessment. In conducting this assessment, the focus was on the health effects that could result from exposure to the contaminants as a result of direct contact, ingestion, or inhalation of the soil by a child playing or a worker working in the area. The analysis focused on the major contaminants of concern, namely TCE and PCBs. TCE is a volatile organic compound that is known to cause cancer in laboratory animals and thus is classified as a carcinogen. TCE is highly mobile and typically migrates through the soil into the groundwater. PCBs are chlorinated compounds that are typically found in transformer oil and are also known carcinogens. PCBs are not very mobile in soils. Prolonged contact with these chemicals at concentrations exceeding current standards may also result in adverse noncarcinogenic health effects.

When there are no ARARs for soil remediation, risk-based remediation goals are used. The EPA has determined that the excess lifetime cancer risk posed by each contaminant following remediation should be between 1×10^{-4} to 1×10^{-6}. This risk level would reduce the probability of contracting cancer, as a result of direct exposure to these contaminants in the soil, to between one additional person in ten thousand to one additional person in one million over a lifetime, with an emphasis on achieving the latter. The EPA considers this to be an acceptable level of risk.

SITE 1

The baseline risk assessment concluded that for current and future soil exposure scenarios, there is no indication that adverse noncarcinogenic health effects exists for this site.

Total excess cancer risks for current soil exposure were calculated to be 2×10^{-4}, with this risk occurring for the adult employee, dermal exposure scenario. PCBs at Site 1 were the major factor in these potential dermal cancer risks. Because of the elevated PCB concentration at the one location, steps were taken to isolate these soils from potential receptors. With this area isolated, revised total excess cancer risks for current soil exposure range from 4×10^{-7} to 1×10^{-5}, with the highest risk occurring for the adult employee, dermal exposure scenario. Estimated total excess cancer risks for future soil exposure scenarios ranged from 9×10^{-11} to 9×10^{-6}, with the highest risks occurring for the adult resident dust inhalation scenario at Site 1. Arsenic at Site 1 was primarily responsible for these projected cancer risks.

SITES 2 AND 3

The contaminants in the soils at Sites 2 and 3 (under the current or in future scenarios) do not represent a significant, direct, non-carcinogenic risk to onsite workers or offsite resident.

Likewise, incremental carcinogenic risks are not indicated for offsite residences under the current soil scenario (excess cancer risk less than 1×10^{-6}). However, carcinogenic risks to onsite workers (under the current and future soil scenarios) and offsite residents (under future soil scenarios) exceed an excess cancer risk of 1×10^{-6}. The risks do not, however, exceed an excess cancer risk of 1×10^{-4}. The contaminants responsible for these risks are PCBs at Site 2 and benzo(a)pyrene at Site 3.

POST-REMEDIAL ACTION SITE RISKS

Implementation of the preferred alternative will reduce the risks posed by the contaminants at each site to within the EPA's acceptable risk range by addressing the higher levels of contamination. This is based on the assumption that the facility will remain to be used for industrial purposes. The risks remaining as a result of the residual contamination being left in place will then be eliminated by the use of a gravel or vegetated soil cover. This action will serve to eliminate any exposure pathways from the adult worker and the offsite resident. Deed restrictions will also be implemented in order to further reduce the possibility that exposures to contaminants will occur in the future.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

The goals for the remedial program have been established through the remedy selection process set forth in 6 NYCRR 375-1.10. These goals have been established to be protective of human health and the environment and to meet ARARs to the maximum extent practicable.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to human health and to the environment presented by the chemicals which have been identified to be at the site through the proper application of scientific and engineering principles.

The remedial action objectives selected for soils at the NWIRP Bethpage site are:

* Comply with contaminant-specific, location-specific, and action-specific ARARs and New York State Standards, Criteria, and Guidance (SCGs).

* Reduce, control, or eliminate the contamination present within site soils.

* Prevent human exposure to contaminated soils at Sites 1, 2 and 3 at concentrations greater than the remedial action goals.

* Prevent leaching of contaminants in soils which could result in groundwater contamination in excess of groundwater remediation goals.

* Prevent offsite migration of contaminants.

Groundwater remediation objectives will be addressed by a second PRAP for Operable Unit #2 - Groundwater. However, the preferred alternative described in this PRAP will address groundwater issues to a certain extent. The limited vapor extraction/air sparging techniques which will be used for soil remediation will also remediate contamination in the upper portions of the water table (10-20 feet).

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The Superfund process, as described in the National Contingency Plan (NCP), requires that the alternative chosen to clean up a hazardous waste site meet several criteria. The alternative must be protective of human health and the environment, be cost effective, and meet the requirements of environmental regulations. Permanent solutions to contamination problems should be developed, whenever possible. These solutions should reduce the volume, toxicity, or mobility of the contaminants. Emphasis is also placed on treating the wastes at the site, when possible.

In the Feasibility Study (FS), which was completed in March 1994, a variety of technologies were studied to determine whether they were applicable for use on the contaminated soils. The technologies determined to be most applicable to these site soils were developed into remedial alternatives.

7.1: Description of Remedial Alternatives for Onsite Soils

The alternatives analyzed for this operable unit are presented below. These are numbered to correspond with the numbers in the Final FS Report dated March 1994.

- Alternative S1: No Action
- Alternative S2A: Clay Capping (Current Industrial Use)
- Alternative S2B: Clay Capping (Future Residential Use)
- Alternative S3: Fixation of Metals, Off-site Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, and In-Situ Vapor Extraction of VOCs
- Alternative S4: Fixation of Metals, Landfilling of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, and In-Situ Vapor Extraction of VOCs
- Alternative S5: Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, Landfilling of Soils Containing PCBs at Concentrations between 10 ppm and less than 50 ppm, and In-Situ Vapor Extraction of VOCs
- Alternative S6: Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, Landfilling of Soils Containing PCBs at Concentrations between 10 ppm and less than 50 ppm, and Limited In-Situ Vapor Extraction of VOCs
- Alternative S7: Fixation of Metals, Incineration of Soils Contaminated with PCBs at Concentrations Greater than or Equal to 50 ppm, Onsite Consolidation and Clay Capping of Soils Containing PCBs at Concentrations between 10 ppm and less than 50 ppm, and Limited In-Situ Vapor Extraction of VOCs
- Alternative S8A: Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, In-Situ Vapor Extraction of VOCs, and Offsite Landfill of Other Metals/Organics (Current Industrial Use Scenario)
- Alternative S8B: Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, In-Situ Vapor Extraction of VOCs, and Offsite Landfill of Other Metals/Organics (Future Residential Use Scenario)
- Alternative S9A: Fixation of Metals, Onsite Low Temperature Stripping of Soils Containing VOCs and PCBs at Concentrations Greater than or Equal to 50 ppm, and Offsite Landfill of Other Metals/Organics (Current Industrial Use Scenario)
- Alternative S9B: Fixation of Metals, Onsite Low Temperature Stripping of Soils Containing VOCs and PCBs at Concentrations Greater than or Equal to 50 ppm, and Offsite Landfill of Other Metals/Organics (Future Residential Use Scenario)
- Alternative S10A: Soil Washing/Onsite Fill of Metals and Organics (Current Industrial Use Scenario) with Offsite Landfill of Metal Treatment Residuals, and Incineration of Organic Treatment Residuals
- Alternative S10B: Soil Washing/Onsite Fill of Metals and Organics (Future Residential Use Scenario) with Offsite Landfill of Metal Treatment Residues, and Incineration of Organic Treatment Residues

Common Elements of the Alternatives

The alternatives that have the "A" and "B" designations denotes that the alternatives are essentially the same except that one assumes that the land will remain to be used for industrial purposes (A), and the other assumes that the future land use will be for residential purposes (B). These alternatives were analyzed to show the cost comparisons between the two assumed land uses. However, as of the date of this document, it is the Navy's intention to continue to use the property at the NWIRP Bethpage for industrial purposes. Therefore, the alternative descriptions that follow will only summarize the alternatives which assume the current industrial use scenario. The Final FS Report may be consulted for an explanation of the alternatives which assume a future residential use scenario.

Only when the Navy has determined that there is no longer a need for this land will changes in land use be considered. There are two methods in place used to determine what the best use of the land would be. One is the General Services Administration (GSA) excessing process and the other is the Base Realignment and Closure (BRAC) process. Both processes involve an analysis of the current land use, scope of any existing environmental problems remaining at the site, cost to remediate the land depending on its future use, and availability of prospective land owners which include other DoD and Federal agencies, State and local agencies, and other interested community parties. Both processes involve communication similar to that of the TRC committee. It is imperative to note that before any change in land use takes place, the appropriate level of environmental remediation will be undertaken depending upon the chosen land use.

The various contaminated soil alternatives being considered include common components. For example, alternatives S3 through S9 all include fixation of metals which exceed the hazardous waste criteria as defined by the U.S. EPA under 40 CFR 261.24. In all cases, arsenic at Site 1 is the contaminant of concern. Arsenic would either be fixated on-site or off-site using a suitable binder such as ferrous sulfate and/or lime to reduce the mobility of the metals. The fixated soil would then be disposed of in an offsite non-hazardous waste landfill.

In addition, alternatives S3 and S5 through S8 call for incineration of PCB-contaminated soils at concentrations greater than or equal to 50 ppm. This action is to comply with regulations set forth in the Toxic Substances Control Act (TSCA), and State regulations. The soils of concern, which only occur at Site 1, will be excavated and transported to an EPA-approved, off-site incineration facility.

Alternatives S3 through S5 and S8 all call for in-situ vapor extraction/air sparging of volatile organic compounds (VOCs). Soils contaminated with VOCs at concentrations greater than action levels would be targeted for treatment. Primary site volatile organics to be addressed include PCE, TCE, and 1,1,1-TCA. In-situ vapor extraction is a demonstrated technology for the removal of VOCs from the unsaturated or vadose zone of soils. Following excavation of the soils with metals exceeding concentrations of concern and PCB "hot spots", the periphery of the contaminated region would be identified and injection/extraction wells placed accordingly. Site 1 VOC-contaminated soils underlying Plant No. 3 would be accessed by drilling injection/extraction wells through the plant floor.

Alternatives S6 and S7 include the use of a limited in-situ vapor extraction/air sparging program to address VOCs. The basic difference from what is described above is that these alternatives will target soils contaminated with VOCs that are three times greater than the action levels selected for the other alternatives. Please note that these modified action levels are still below NYSDEC's clean-up guidelines for these VOCs. The volume of soil to be addressed by these alternatives represents 34% of the total volume of VOC-contaminated soil, however, approximately 94% of the quantity of VOCs in the soils will be treated. The relatively low concentration of VOCs that remain in place will be removed over a period of time by natural attenuation and flushing. The period of time to accomplish this should be no longer than the time that is anticipated for groundwater remediation (approximately 30 years).

Vapor extraction utilizes an induced vacuum to pull air through the soil. The vacuum transports volatile organic contaminants out of the soil to a vapor collection system. Upon withdrawal, the contaminated air stream is treated with a technique appropriate for the specific compounds. Carbon adsorption has been selected as the representative process option, based on anticipated air stream contaminant concentrations. Spent carbon would be regenerated either offsite or onsite.

Both of the vapor extraction systems described above would also be used to treat the soils in the upper few feet of the saturated zone. This will be accomplished by pumping air into the groundwater. Contaminants are stripped from the groundwater into the air as the air migrates upward towards the unsaturated zone where it is captured by the vacuum system described above.

Finally, after implementation of any of the alternatives S3 through S7, residual contamination will remain in place. In order to insure that exposure pathways are eliminated from contact with the residual contamination, a 6-inch gravel cover or a 6-inch vegetated soil cover would be employed for areas with other metal- and organic-contaminated soils at concentrations greater than action levels. Deed restrictions would also be required to restrict certain types of activities on the site. This cover must be of a permeable nature in order to promote infiltration and natural attenuation of the residual VOCs.

Please note that the soil volumes presented below are preliminary and may be modified based on additional testing that would be conducted during the Remedial Design/Remedial Action stage.

Alternative S1 - No Action

- Estimated Capital Cost: $0
- Estimated Annual O&M Cost: $20,000/5 years
- Estimated Present Worth Cost (30-yr): $56,000
- Estimated Implementation Time frame: Immediately

This alternative has been developed and retained for baseline comparison purposes with the other alternatives, as required by the NCP. The only activity that would occur under the this alternative is periodic reviews, typically every 5 years.

Alternative S2A - Clay Capping (Current Industrial Use)

- Estimated Capital Cost: $3,779,000
- Estimated Annual O&M Cost: $19,000
- Estimated Present Worth Cost (30-yr): $4,065,000
- Estimated Implementation Time frame: 1 to 3 years

Alternative S2A was developed as a containment response action. At each of the three sites, contaminated soils with metals and organics concentrations greater than the current industrial use scenario action levels would be capped. Primary contaminants contained include chlorinated volatile organics (TCE, PCE, and TCA), arsenic, PCBs, and various other metals and organics. Although contaminated soils would remain in place, exposure pathways are reduced. An impermeable clay cap system is featured. The clay cap system consists of 6 inches of gravel overlain by 1 foot of compacted clay, and then 6 inches of gravel covered by 2 feet of clean soil. Soil conditioning, fertilization, and revegetation would be employed as necessary, based on end use and erosion considerations.

Deed restrictions would also be required to restrict future use of the affected areas.

Alternative S2A results in the capping of approximately 63,200 square yards (Site 1- 7,800 square yards; Site 2- 31,200 square yards; Site 3- 24,200 square yards). This acreage excludes the Site 1 VOC-contaminated soils underlying Plant No. 3 and the concrete area adjacent to Plant No. 3, which already serves as an effective cap.

Alternative S3 - Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, and In-Situ Vapor Extraction of VOCs

- Estimated Capital Cost: $16,847,000
- Estimated Annual O&M Cost: $14,000
- Estimated Present Worth Cost (30-yr): $17,056,000
- Estimated Implementation Time frame: 4 years

Alternative S3 combines removal/treatment/disposal and in-situ treatment response actions. This alternative addresses soil "hot spots" (i.e., metals at concentrations greater than hazardous waste criteria, as defined by the EPA under 40 CFR 261.24, and PCB concentrations greater than or equal to 50 ppm) using conventional techniques. Additionally, the primary site contaminants, VOCs, are addressed using in-situ vapor extraction and air sparging.

The 6-inch gravel or vegetated soil cover would be employed along with deed restrictions for those areas where residual contamination remains.

The "hot spots" to be addressed include fixation and disposal of soils containing arsenic at concentrations in excess of hazardous waste criteria along with excavation and transportation of PCB-contaminated soil with concentrations at or above 50 ppm to an approved offsite incineration facility.

Soil volumes include:
- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 300 cubic yards of PCB-contaminated soil (Site 1 only)
- 239,900 cubic yards of VOC-contaminated soil (Site 1- 115,400 cubic yards; Site 2- 3,100 cubic yards; Site 3- 121,400 cubic yards) to undergo in-situ vapor extraction (Site 1 soil volume includes the VOC-contaminated soils underlying Plant No. 3 and the concrete area adjacent to Plant No. 3).

Alternative S4 - Fixation of Metals, Landfilling of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, and In-Situ Vapor Extraction of VOCs

- Estimated Capital Cost: $15,900,000
- Estimated Annual O&M Cost: $14,000
- Estimated Present Worth Cost (30-yr): $16,110,000
- Estimated Implementation Time frame: 4 years

All of the components of this alternative are essentially the same as those described in Alternative S3, except that soils with PCB concentrations greater than or equal to 50 ppm would be transported to an approved off-site landfill instead of incinerated.

Soil volumes include:
- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 300 cubic yards of PCB-contaminated soil to be landfilled off-site (Site 1 only)
- 239,900 cubic yards of VOC-contaminated soil (Site 1- 115,400 cubic yards; Site 2- 3,100 cubic yards; Site 3- 121,400 cubic yards) to undergo in-situ vapor extraction (Site 1 soil volume includes the VOC-contaminated soils underlying Plant No. 3 and the concrete area adjacent to Plant No. 3).

Alternative S5 - Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, Landfilling of Soils Containing PCBs at Concentrations between 10 ppm and Less than 50 ppm, and In-Situ Vapor Extraction of VOCs

- Estimated Capital Cost: $19,441,000
- Estimated Annual O&M Cost: $14,000
- Estimated Present Worth Cost (30-yr): $19,651,000
- Estimated Implementation Time frame: 4 years

Alternative S5 consists of the essentially the same components/soil volumes as Alternatives S3, except that Alternative S5 provides for offsite landfilling of soils with PCB concentrations between 10 ppm and less than 50 ppm. As with Alternatives S3, these areas would then be covered with a permeable cover along with the other soils contaminated with metals and organics greater than the action levels and deed restrictions imposed.

Soil volumes include:

- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 300 cubic yards of PCB-contaminated soil to be incinerated off-site (Site 1 only)
- 3,700 cubic yards of PCB-contaminated soil with concentrations between 10 ppm and 50 ppm (Site 1- 1,100 cubic yards; Site 2- 2,600 cubic yards)
- 239,900 cubic yards of VOC-contaminated soil (Site 1- 115,400 cubic yards; Site 2- 3,100 cubic yards; Site 3- 121,400 cubic yards) to undergo in-situ vapor extraction (Site 1 soil volume includes the VOC-contaminated soils underlying Plant No. 3 and the concrete area adjacent to Plant No. 3).

Alternative S6 - Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, Landfilling of PCBs between 10 ppm and Less than 50 ppm, and Limited In-Situ Vapor Extraction of VOCs

- Estimated Capital Cost: $10,655,000
- Estimated Annual O&M Cost: $14,000
- Estimated Present Worth Cost (30-yr): $10,865,000
- Estimated Implementation Time frame: 4 years

Alternative S6 is similar to Alternative S5, except Alternative S6 addresses a more limited volume of VOC-contaminated soils. Soils contaminated with VOCs at concentrations greater than the modified action levels would be processed via in-situ vapor extraction and air sparging. As described earlier, the modified action levels for VOCs are equal to three times the VOC-action levels considered under other alternatives.

Soil volumes include:

- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 300 cubic yards of PCB-contaminated soil to be incinerated off-site (Site 1 only)
- 3,700 cubic yards of PCB-contaminated soil with concentrations between 10 ppm and 50 ppm (Site 1- 1,100 cubic yards; Site 2- 2,600 cubic yards)
- 87,000 cubic yards of VOC-contaminated soil (Site 1 and underneath Plant No. 3) to undergo limited in-situ vapor extraction

Alternative S7 - Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 50 ppm, On-site Consolidation and capping of PCBs between 10 ppm and Less than 50 ppm, and Limited In-Situ Vapor Extraction of VOCs

- Estimated Capital Cost: $8,250,000
- Estimated Annual O&M Cost: $14,000
- Estimated Present Worth Cost (30-yr): $8,459,000
- Estimated Implementation Time frame: 4 years

Alternative S7 is similar to Alternative S6, except that under Alternative S7 the PCB-contaminated soils, with a PCB concentration of 10 ppm to 50 ppm, would be consolidated in one area and a composite cap would be used to limit infiltration in that area.

This alternative includes onsite consolidation of soils containing PCBs in concentrations between 10 ppm and less than 50 ppm. An area in the northwest corner of Site 2 (the former sludge drying beds) has been identified as a potential location for the consolidated material and cap. However, other areas at the NWIRP are also potentially viable. A final decision as to the location of the consolidated area will be made during the design phase. Onsite capping of marginally-contaminated soils, such as these, is an acceptable method and is more economical than offsite landfilling or incineration. The cap system would consist of 6 inches of soil, overlain by a low permeability (1×10^{-12} cm/sec) plastic geomembrane, followed by 24 inches of topsoil. Institutional controls, including deed restrictions, would be implemented to guarantee the integrity of the system. A post-closure monitoring plan would be developed and implemented to ensure that the cap is properly maintained and is functioning properly.

Soil volumes include:
- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 300 cubic yards of PCB-contaminated soil to be incinerated off-site (Site 1 only)
- 3,700 cubic yards of PCB-contaminated soil with concentrations between 10 ppm and less than 50 ppm (Site 1- 1,100 cubic yards; Site 2- 2,600 cubic yards) to be consolidated and capped onsite
- 87,000 cubic yards of VOC-contaminated soil (Site 1 and underneath Plant No. 3) to undergo limited in-situ vapor extraction

Alternative S8A - Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or equal to 50 ppm, In-Situ Vapor Extraction of VOCs, and Offsite Landfill of Other Metals/Organics (Current Industrial Use Scenario)

- Estimated Capital Cost: $44,490,000
- Estimated Annual O&M Cost: $14,000
- Estimated Present Worth Cost (30-yr): $44,700,000
- Estimated Implementation Time frame: 5 years

Alternative S8A was developed to address all site contamination via conventional treatment. This alternative combines removal/treatment/disposal and in-situ treatment response actions. This alternative is essentially the same as Alternative S3, with the addition of excavation/offsite landfill for soils contaminated with other metals and organics at concentrations greater than the industrial use scenario. These soils with other metal- and organic-contamination represent low level contamination and can likely be safely disposed of in a nonhazardous landfill.

Alternative S8A includes fixation and off-site disposal of soils contaminated with arsenic at concentrations greater than the hazardous waste criteria, which occurs only at Site 1 and the excavation and transportation to an off-site incineration facility for PCB-contaminated soil with concentrations greater than or equal to 50 ppm.

All soils contaminated with VOCs at concentrations greater than action levels would be processed with the in-situ vapor extraction and air sparging systems.

Soils with other metal and organic concentrations greater than the current industrial use action levels would be excavated and disposed in an offsite landfill only after the in-situ vapor extraction is complete so that the soils slated for offsite disposal are first freed of VOCs. To minimize costs, the offsite disposal of other metal- and organic-contaminated soils includes two different types of landfills. Site 1- and Site 2-associated soil, which contains low-level PCB contamination (up to <50 ppm), would be sent to a nonhazardous waste landfill. Site 3-associated soil could potentially be used as cover material for a municipal or private landfill.

Deed restrictions would not be required to restrict industrial use of the site since no contaminated soil exceeding current industrial use action levels remains in place.

Soil volumes include:
- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 300 cubic yards of PCB-contaminated soil to be incinerated off-site (Site 1 only)
- 239,900 cubic yards of VOC-contaminated soil (Site 1- 115,400 cubic yards; Site 2- 3,100 cubic yards; Site 3- 121,400 cubic yards) to undergo in-situ vapor extraction
- 62,600 cubic yards of other metals/organics contaminated soil (Site 1- 11,700 cubic yards; Site 2- 31,900 cubic yards; Site 3- 19,000 cubic yards) to be disposed of offsite.

Alternative S9A - Fixation of Metals, Onsite Low Temperature Stripping of Soils Containing VOCs and PCBs at Concentrations Greater than or equal to 50 ppm, and Offsite Landfill of Other Metals/Organics (Current Industrial Use Scenario)

- Estimated Capital Cost: $109,376,000
- Estimated Annual O&M Cost: $4000
- Estimated Present Worth Cost (30-yr): $109,428,000
- Estimated Implementation Time frame: 5 years

As with Alternative S8A, Alternative S9A was also developed to address all site contamination using a combination of removal/treatment/disposal and removal/disposal response actions. Metals present in soil "hot spots" are addressed using conventional techniques and soils with other metals and organics greater than the industrial use scenario are safely disposed of in a nonhazardous waste landfill. However, VOC- and PCB- (at a concentration greater than or equal to 50 ppm) contaminated soils are addressed via low temperature thermal stripping. Soils contaminated with other metals and organics at concentrations greater than the industrial use scenario would be excavated and disposed of in an offsite landfill. These soils with other metal- and organic-contamination represent low level contamination and can likely be safely disposed of in a nonhazardous landfill.

Soils contaminated with VOCs at concentrations greater than action levels and PCBs at concentrations greater than or equal to 50 ppm would be processed via low temperature thermal stripping. Primary contaminants to be addressed include PCE, TCE, and 1,1,1-TCA for the majority of the soils and PCBs for a limited volume of the soils. Following removal of the soils with metals at a hazardous level "hot spots", soils contaminated with concentrations of VOCs greater than the action levels and soils with PCBs concentrations greater than or equal to 50 ppm would be excavated and processed through low temperature thermal stripping. The Site 1 Plant No. 3 floor and concrete area adjacent to Plant No. 3 would be removed to allow access to underlying VOC-contaminated soils. For all soil containing VOC contamination only, the resultant processed soils would then be reused as onsite fill. However, for soils that contain both VOCs and other metals and organics above the action levels, the processed soils would further require offsite landfill disposal. Initially the soil may require screening to separate out oversized material. The soil would then be tilled and passed through a thermal desorption unit. Treatment of the offgas from the process would be via onsite thermal destruction; or condensation, recirculation, and offsite treatment/disposal of condensates.

Soils with other metal and organic concentrations greater than the current industrial use action levels would be disposed in an offsite landfill, only after the low temperature thermal stripping is complete to first free the soils of VOCs.

To minimize costs, the offsite disposal of other metals/organics-contaminated soil includes two different types of landfills. Site 1- and Site 2-associated soils, which contain low-level PCB contamination up to 50 ppm, would be sent to a nonhazardous waste landfill. Site 3-associated soil could potentially be used as cover material for a municipal or private landfill.

Deed restrictions would not be required to restrict industrial use of the site since no contaminated soil exceeding current industrial use action levels remains in place.

Soil volumes include:

- 600 cubic yards of arsenic-contaminated soil (Site 1 only)
- 234,200 cubic yards of VOC-contaminated or PCB-contaminated soil (Site 1- 115,700 cubic yards; Site 2- 3,100 cubic yards; Site 3- 121,400 cubic yards) to undergo low temperature thermal stripping
- 62,600 cubic yards of other metals/organics contaminated soil (Site 1- 11,700 cubic yards; Site 2- 31,900 cubic yards; Site 3- 19,000 cubic yards) to be disposed of off site.

Alternative S10A - Soil Washing/Onsite Fill of Metals and Organics (Current Industrial Use Scenario) with Offsite Landfill of Metal Treatment Residuals, and Incineration of Organic Treatment Residuals

- Estimated Capital Cost: $91,597,000
- Estimated Annual O&M Cost: $4000
- Estimated Present Worth Cost (30-yr): $91,649,000
- Estimated Implementation Time frame: 5 years

Alternative S10A addresses all site contamination through one technology; soil washing. This alternative represents a removal/treatment/disposal response action. Although technical effectiveness may be diminished by attempting to address all contaminants simultaneously, cost effectiveness should be favorable.

For Alternative S10A, contaminated soils would be excavated and processed with a soil washing technique to remove the contaminants from the soil matrix. The Site 1 Plant No. 3 floor and concrete area adjacent to Plant No. 3 would be removed to allow access to underlying VOC-contaminated soils. Following soil washing, the processed soils would then be placed as onsite fill. The organic treatment residuals would subsequently be incinerated offsite. The metals treatment residuals would be disposed of at an offsite landfill. The metals residuals may require fixation prior to disposal.

Soil washing extracts/leaches contaminants from the soil. This process is accomplished by passing a leaching solution through the soils using an injection/recirculation process. Usually pretreatment of the soil feed is required such as screening and conditioning. Separate leaching processes are usually required for soils contaminated with both inorganics and organics due to the specific nature of the leaching solutions.

Deed restrictions would not be required to restrict industrial use of the site since no contaminated soil exceeding current industrial use action levels remains in place. Likewise, no deed restrictions are required for future residential use, which employs less stringent action levels.

Soil volumes include:

- 296,000 cubic yards of contaminated soil (Site 1- 119,700 cubic yards; Site 2- 36,300 cubic yards; Site 3- 140,400 cubic yards) to undergo soil washing

7.2: Evaluation of Remedial Alternatives for Onsite Soils

In conformance with the NCP, the following nine criteria were used to evaluate each of the retained alternatives during the detailed analysis:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Short-Term Effectiveness
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume
- Implementability
- Cost
- State Acceptance
- Community Acceptance

The following sections the performance of each soil alternative is evaluated against the nine criteria items listed above.

THRESHOLD CRITERIA

The first two items are referred to as threshold criteria. An alternative must meet both threshold criteria or be eliminated from further consideration.

Overall Protection of Human Health and the Environment

All of the alternatives, with the exception of the "no action" alternative, would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, or institutional controls.

The no action alternative would not be protective of human health and the environment. Contaminants would remain in the soils and could affect human health through dermal contact, accidental ingestion, and fugitive dust inhalation. Also, VOCs would continue to migrate into the groundwater. Because this alternative fails this threshold criteria item, it will not be considered further in this analysis as an option for this site.

Alternative S2 would be protective of human health by preventing contact with the contaminants, and the environment by minimizing groundwater infiltration and resulting groundwater contamination. Alternatives S3 through S10 address the major chemical threats at the site by removing and treating (or offsite landfilling under Alternative S4) soils with PCB concentrations greater 50 ppm and hazardous wastes, and treating soils contaminated with VOCs. Alternatives S3 through S7 provide protection of human health for the balance of the site contaminants by providing a barrier. Alternatives S5 and S6 would be slightly more protective than S3 and S4 with respect to PCBs since lower concentrations of PCBs would remain at the site. Alternative S7 achieves a similar level of protection to Alternatives S5 and S6 by placing PCB-contaminated soils in an onsite capped area. Alternatives S8 and S9 would provide this protection by placing the contaminants in an offsite landfill. Under Alternative S10, the contaminants would be separated from the soils. The contaminants would then be treated offsite. Alternatives S6 and S7 would be slightly less protective of the groundwater than Alternatives S2 through S5 and Alternatives S8 through S10, since residual VOCs at concentrations up to 3 time the action levels would remain in soil. Because of natural attenuation, the threat to groundwater would decrease with time.

Compliance with ARARs

Alternatives S2 through S10 should comply with all ARARs and Alternatives S8 through S10 would comply with the Office of Solid Waste and Emergency Response (OSWER) directive for PCB contamination and the NYSDEC soil guidelines. Alternatives S3 and S4 would not comply with NYSDEC soil guidelines or the OSWER directive for PCBs. Alternatives S5 through S7 would comply with only the industrial use scenario under these To Be Considered (TBC) guidance.

Action-specific ARARs include Federal and State RCRA program requirements for excavation and treatment of hazardous waste, TSCA requirements for soils with PCB concentrations greater 50 ppm, and state Air Pollution Control regulations for Alternatives S3 through S7, and S9.

BALANCING CRITERIA

The next five items are known as balancing criteria. These provide the foundation for analysis of alternatives and is the basis of selecting a preferred remedy.

Short-Term Effectiveness

Adverse impacts to the community are not expected during implementation of Alternatives S2 - S8. Soil handling activities associated with Alternatives S2 through S10 are expected to generate minimal quantities of fugitive dust and VOCs. Dust generation would be controlled through common practices such as wetting of the soils. VOCs would be monitored and controlled if necessary using a foam-type suppressant. Alternatives S9 and S10 may result in some disruptions to the local community due to the size of the excavation which may extend beyond the site boundary.

Alternative S2 can be completed within 1 to 3 years after signing of the ROD. Alternatives S3, S4, S5, S6, and S7 would require approximately 2 to 4 years to complete. Alternatives S8 through S10 would require 3 to 6 years after signing of the ROD to complete.

Long-Term Effectiveness and Permanence

Under Alternative S2, the contaminants would remain, however, a clay cap would be used to isolate the contaminants from the public and minimize infiltration of precipitation. Deed restrictions would be used to control future excavations into the area. Alternatives S3 through S10 address removal, treatment, and/or offsite disposal of RCRA characteristic wastes, TSCA regulated wastes, and NYSDEC regulated hazardous wastes. Also, the soils would be treated for removal of volatile organics. Alternatives S3, S4, S5, S8, S9, and S10 target removal of all VOCs greater than the baseline VOC action levels. Alternatives S6 and S7 target removal of approximately 94% of the VOC contamination, with the residual VOC concentrations at only one to three times the action levels.

Under Alternatives S3 through S7, contaminants (metals and other organics) at concentrations greater than the action levels would remain, however these soils would be covered to isolate the contaminants from the public. Under Alternatives S8 through S10, the contaminants (metals and other organics) would be removed from the site. Alternatives S8 and S9 use offsite landfilling to dispose of these contaminants. Alternative S10 includes onsite soil washing to separate the contaminants from the soils. The concentrated contaminant residues would be treated and disposed off site.

Off-site incineration of soils with PCB concentrations greater than 50 ppm (Alternatives S3, S5 through S10) is expected to permanently destroy the PCBs. Fixation and offsite landfilling of hazardous soils (Alternatives S3 through S10) is also expected to be relatively permanent. Treatment of the soils for VOCs under Alternatives S3 through S10 includes capture of the VOCs and thermal destruction. The clay cap for all contaminated areas (Alternative S2) and the cap for a PCB-contaminated soils at concentrations of 10 to <50 ppm (Alternative S7), and the soil/gravel cover (Alternatives S3 through S7) when coupled with deed restrictions are somewhat permanent. However, long term maintenance of the cap or cover would be required.

Under Alternatives S2 though S10, the residual risks are less than 1×10^{-6}. Under Alternative S2, if the cap and deed restrictions are not effective, then the residual risks exceed 1×10^{-4}. Under Alternatives S3 through S7, if the cap and deed restrictions are not effective then the residual risks are the in the range of 1×10^{-4} to 10^{-6}. Under Alternatives S8 through S10, there are no restrictions on future use of the site.

Alternatives S2 through S5 and S8 through S10 would be protective of groundwater at the completion of soil remediation. Alternatives S6 and S7 minimize future VOC contamination of the groundwater, by treating the most contaminated soils. However, low level VOC groundwater contamination would continue until the residual VOCs are flushed from the soils (10 to 30 years). Alternative S2 relies on the continued effectiveness of the clay cap. Alternatives S3 through S10 remove these contaminants from the site.

Reduction of Toxicity, Mobility, or Volume

There is no reduction in toxicity, mobility or volume under Alternative S2, since no treatment is used. Alternatives S3, and S5 through S10 all use thermal treatment to eliminate the toxicity of PCBs (at concentrations greater than 50 ppm), and fixation (also including Alternative S4) to reduce the mobility of arsenic (determined to be hazardous, as defined by the EPA under 40 CFR 261.24), by 50 to 99%. The volume of contaminated soil is reduced by approximately 87,000 cubic yards under Alternatives S6 and S7; by approximately 240,000 cubic yards under Alternatives S3, S4, S5, S8 and S9; and by approximately 290,000 cubic yards under Alternative S10.

Alternatives S3 through S8 also employ in-situ vapor extraction and air sparging to treat VOC-contaminated soils. Alternative S9 uses LTTS to treat these VOC-contaminated soils, as well as to treat PCB-contaminated soils (at a concentration greater than 50 ppm). Alternative S10 uses soil washing to treat the VOC-contaminated soils as well as the other organics and metal contaminants.

Implementability

Alternatives S2 - S8 should be implementable. Equipment and resources and TSD facilities are available as applicable. Alternative S2, and to a lesser extent Alternative S7, involve a clay cap which would significantly affect the future use of the site. In-situ vapor extraction, LTTS, and soil washing are relatively new processes. Also, there are only limited vendors available to perform the work under Alternatives S3 through S10; however, these issues are not expected to be critical. Alternatives S8 and S9 both include the offsite landfilling of significant quantities of contaminated soil (approximately 60,000 cubic yards). Landfills are available, however space is limited. Alternatives S9 and S10 involve excavating soils to a depth of 50 plus feet, and would be extremely difficult to implement.

Cost

The costs associated with each of the soil alternatives is provided in Table 1.

MODIFYING CRITERIA

These last two items are called modifying criteria. These are usually assessed after receipt of public comments on the proposed plan but can alter the preferred remedy if the alternative does not receive favorable public response.

State Acceptance

State acceptance (NYSDEC and NYSDOH) of the preferred alternative described below has been given. Since this document is a joint Navy and NYSDEC publication, NYSDEC has reviewed it and provided comments. All applicable comments have been incorporated.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for this operable unit.

SECTION 8: SUMMARY OF THE PREFERRED REMEDY

Based upon the information available at this time, the Navy and NYSDEC are proposing Alternative S7 as the preferred remedy for onsite soils at NWIRP Bethpage.

Alternative S7 was selected because it is considered to be protective of human health and the environment, complies with ARARs, is readily implementable, and satisfies the requirements of reducing the toxicity, mobility and volume of contaminants. In addition, this alternative provides for substantial risk reduction by utilizing permanent solutions but also provides for the safe management of residual contamination that will remain at the site. Finally, Alternative S7 achieves all of this and still represents the least cost alternative, except for Alternative S1 which is not considered to be protective of human health and the environment, and Alternative S2 which is less protective of human health and the environment than S7.

Figure 11 shows a diagram illustrating the steps associated with the Alternative S7. In summary, the main elements of the preferred alternative are:

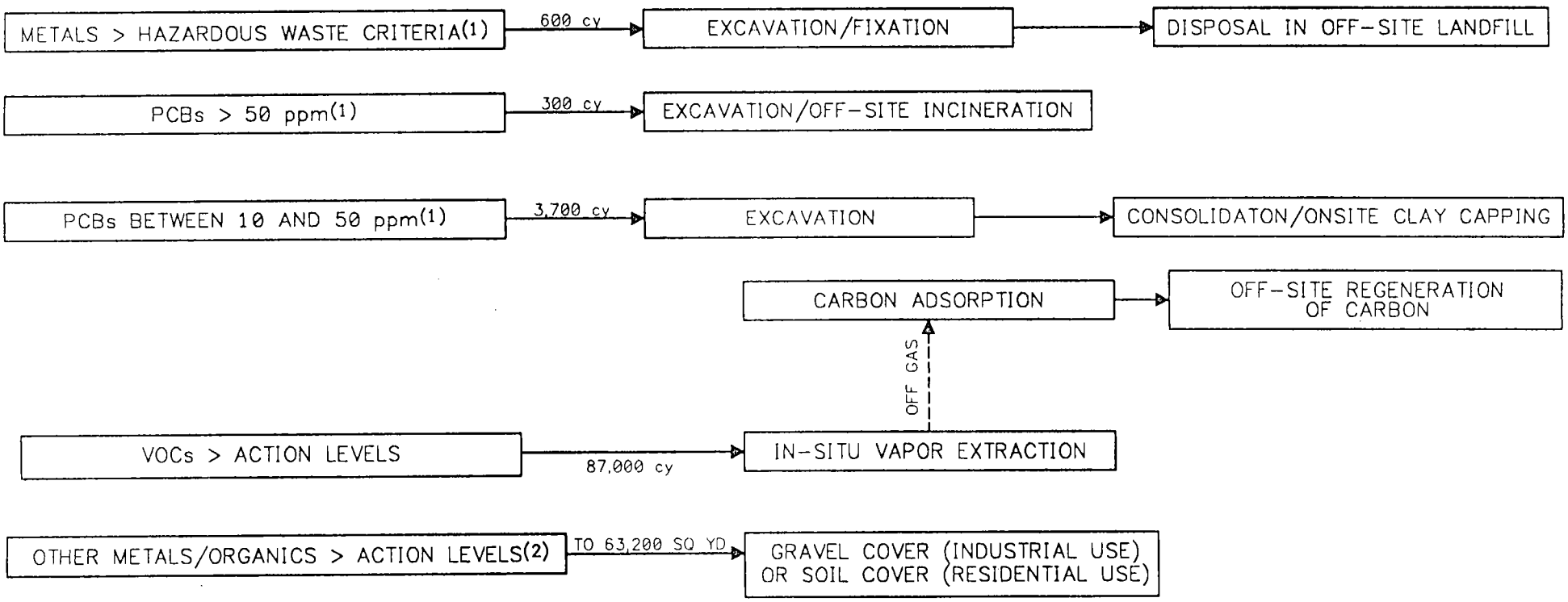
* Onsite or offsite fixation of metals in excess of hazardous waste criteria. This is for arsenic at Site 1 only.
* Excavation and offsite incineration of PCBs at concentrations greater than 50 ppm (Site 1 only).
* Onsite Consolidation and capping of soils contaminated with PCBs at concentrations between 10 and 50 ppm.
* Limited In-Situ Vapor Extraction of VOCs which will represent approximately 34% of all VOC-contaminated soil but will address approximately 94% of the quantity of VOCs in the soils.

TABLE 1

SUMMARY OF SOILS ALTERNATIVES COSTS
NWIRP, BETHPAGE, NEW YORK

Alternative No.		Current Industrial Scenario			Future Residential Scenario		
		Capital Cost	O&M Cost/Yr	Present Worth Cost (30-Yr)	Capital Cost	O&M Cost/Yr	Present Worth Cost (30-Yr)
S1 -	No Action [1]	S1- $ 0	$ 4,000	$ 56,000	-----	-----	-----
S2 -	Clay Capping	S2A - $ 3,779,000	$ 19,000	$ 4,065,000	S2B - $ 3,546,000	$ 18,000	$ 3,817,000
S3 -	Fixation of Metals, Incineration of PCBs >50 ppm, and In-Situ Vapor Extraction of VOCs [1,4,5]	S3 - $ 16,847,000	$ 14,000	$ 17,056,000	-----	-----	-----
S4 -	Fixation of Metals, Offsite Landfill of PCBs >50 ppm, and In-Situ Vapor Extraction of VOCs [5]	S4 - $ 15,900,000	$ 14,000	$ 19,651,000	-----	-----	-----
S5 -	Fixation of Metals, Incineration of PCBs> 50 ppm, Offsite Landfill of PCBs between 10 ppm and 50 ppm, and In-Situ Vapor Extraction of VOCs [1,5]	S5 - $ 19,441,000	$ 14,000	$ 19,651,000	-----	-----	-----
S6 -	Fixation of Metals, Incineration of PCBs> 50 ppm, Offsite Landfill of PCBs between 10 ppm and 50 ppm, and Limited In-Situ Vapor Extraction of VOCs [1,5]	S6 - $ 10,655,000	$ 14,000	$ 10,865,000	-----	-----	-----
S7 -	Fixation of Metals, Incineration of PCBs> 50 ppm, Onsite consolidation and clay capping of PCBs between 10 ppm and 50 ppm, and Limited In-Situ Vapor Extraction of VOCs [1,5]	S7 - $ 8,250,000	$ 14,000	$ 8,459,000	-----	-----	-----
S8 -	Fixation of Metals, Incineration of PCBs> 50 ppm, In-Situ Vapor Extraction of VOCs, and Offsite Landfill of Other Metals/Organics [2]	S8A - $ 44,490,000	-----	-----	S8B - $ 41,758,000	-----	-----
S9 -	Fixation of Metals, Onsite Low Temperature Thermal Stripping of VOCs and PCBs, and Offsite Landfill of Other Metals/Organics [2]	S9A - $109,376,000	-----	-----	S9B - $105,637,000	-----	-----
S10 -	Soil Washing/Onsite Fill of Metals and Organics with Offsite Landfill of Metal Treatment Residuals, and Incineration of Organic Treatment Residuals [2]	S10A - $ 91,597,000	-----	-----	S10B - $ 89,907,000	-----	-----

(1) Costs for current industrial use scenario and future residential use scenario are identical.
(2) No long-term operating costs are incurred since no residual contamination remains on site; therefore, present worth costs are not applicable.
(3) Note that the costs presented are preliminary and may be modified based on additional testing that would be conducted during the Remedial Design/Remedial Action stage.
(4) The estimated capital and present worth costs for Alternative S3 with only limited In-Situ Vapor Extraction would be $8,061,000 and $8,270,000, respectively.
(5) Alternatives S3 through S7 also include permeable covering and deed restriction components for the remaining soils with chemical concentrations greater than the action levels.



(1) TO BE CONDUCTED PRIOR TO VOCs TREATMENT
(2) TO BE CONDUCTED FOLLOWING VOCs TREATMENT

NOTE:

1. SOIL ACTION LEVELS ARE PRESENTED IN TABLE 2-12. UNLESS OTHERWISE NOTED, THE SOIL ACTION LEVEL IS THE MINIMUM OF THE RISK-BASED, ARAR-BASED, AND TBC-BASED GOALS.
2. AREAS AND VOLUMES PRESENTED ARE PRELIMINARY AND MAY BE REVISED DURING THE REMEDIAL DESIGN AND REMEDIAL ACTION STAGES.

SOILS ALTERNATIVES S7A AND S7B
FIXATION OF METALS, INCINERATION OF PCBS > 50 ppm
ONSITE CONSOLIDATION AND CLAY CAPPING OF
PCBs BETWEEN 10 ppm AND 50 ppm
IN-SITU VAPOR EXTRACTION OF VOCS
AND COVER OF OTHER METALS/ORGANICS > ACTION LEVELS
NWIRP, BETHPAGE, NEW YORK

FIGURE 11

HALLIBURTON NUS
Environmental Corporation

GLOSSARY OF ACRONYMS

ARAR	Applicable and Relevant and Appropriate Requirement
BWD	Bethpage Water District
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Codes of Federal Regulations
EPA	Environmental Protection Act
FS	Feasibility Study
GAC	granular activated carbon
GC	gas chromatograph
IAS	Initial Assessment Study
LTTS	low-temperature thermal stripping
NCP	National Contingency Plan
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NWIRP	Naval Weapons Industrial Reserve Plant
OSWER	Office of Solid Waste and Emergency Response
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
ppb	parts per billion
ppm	parts per million
PRAP	Proposed Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SCG	Standards, Criteria, and Guidance
TBC	To Be Considered (guidance)
TCA	trichloroethane
TCE	trichloroethene
TRC	Technical Review Committee
TSCA	Toxic Substances Control Act
TSD	Transfer, Storage, and Disposal
VOC	volatile organic compound